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Translation

SOVIET SCIENCE AND TECHNOLOGY POLICY

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3 February 1981

SOVIET SCIENCE AND TECHNOLOGY POLICY

This non-serial report contains selected translations of Russian articles on the planning and administration of Soviet research and development and the introduction of scientific achievements into industry.

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PRECISION BEARING PRODUCTION TECHNOLOGY DEVELOPED IN LENINGRAD

Leningrad LENINGRADSKAYA PRAVDA in Russian 11 Nov 80 p 2

[Article by Ya. Strugach: "The Logic of Victory"]

[Text] All this could happen, one would think, at almost any Leningrad factory. Of course, to have such brilliant results, you would have to have people not only with appropriate experience and qualifications but also great talent. Yet, on the other hand, if you look them over, they were working here before and none of them were especially singled out or selected from the hundreds of thousands of engineers, workers, and managers. However, now it seems as if, in fact, they were chosen people who were engaged in this problem, and you have to think how much talent we have and that the story about which we are speaking is a beautiful illustration of how unlimited human capabilities must be tapped and led into action.

One wise individual has pointed out: "Insoluble tasks must face us. In this, basically, lies the key to understanding what has happened at the machine-tool plant imeni Il'ich. Because the task that stood before each individual worker in the factory, it seems, was insoluble, and the insolubility depended on many factors."

To make the essence of the question clear, we must begin with that historic day when the wheel was invented. Of course, no one knows precisely, but, at any rate, it can be said with confidence that if this great invention was made in the morning, then by evening of the same day, some six thousand millennia ago, they had created bearings -- the supports in which the wheel turns. For without bearings, the wheel has no meaning.

This is the technical logic. But it does not exist by itself, and humanity understands this.

Soon we will mark the one hundredth year from one important invention -- the cradle bearing, better known as the ball bearing. Humankind literally rode into the 20th Century on velocipedes and motors, regularly helped along by the ball bearing.

But here begins another logic, another natural law.

The Swedish firm "SKF" could see from the first a brilliant future in the new ball bearing. The firm's trade mark was symbolic: it was a globe with the axis supported by bearings. The world turned with the aid of "SKF."

To make bearings requires precision machine tools. To make machine tools requires bearings.

This natural law is used to an advantage not only in a technical sense but also in a diplomatic and military sense.

Before the revolution, the SKF firm had a small shop in our country, where bearings were assembled from Swedish components. Nothing could spin without help from SKF. But things could sometimes stop when the firm so wished.

Today, when a new factory begins to operate in our country every day, we forget at times in our daily life how intertwined are the technical and political laws of nature and how long these and other consequences have been felt. Only in 1932 did the First State Bearing Factory begin to be built in Moscow. Its production soon went to the "thirty-four," "Ily," and other formidable technology which turned out to be faster, more dependable, and more economical than Western technology. There was a historic natural law operating in this.

In 1934, the Leningrad Machine-Tool Factory imeni Il'ich also turned out its first production. Not much could yet be said of the machine tools; they made the simplest of grindstones.

In the 1960's, the president of the American machine-tool firm "Bryant," visiting Moscow, wished to see the factory imeni Il'ich. He arrived in Leningrad only for one day and was anxious. He walked around all of the factory shops and came away in a good frame of mind. He became animated and candid: "My impression? Beautiful! I can give you drawings of all our machine tools, but you would gain nothing. You cannot make machine tools for manufacturing instrument bearings with such technology, with such equipment and materials, and with such personnel."

The "personnel" frowned, but looked upon the Bryant president with interest. When Bryant was mastering precision and were conquering markets and growing rich, these "personnel" were boys and were making breechblocks for machine-guns under the inconceivable conditions of the Leningrad blockade.

Then they began again to make machine tools -- grinding machines, including ones for bearing factories and they felt that they were behind in that eternal struggle of human thought against friction. In our time, it has become a struggle for precision and speed; bearings are required not only for engines but also for instruments. In the instruments of a present airliner, there are up to 20 thousand bearings weighing a gram or half a gram. Ten such bearings can be placed on a kopeck coin.

To make such a bearing, it is necessary to have machine tools of astonishing precision. Imagine the following: the thickness of a human hair is 50 to 70 microns. The diameter of the inner opening of an instrument bearing must be no larger or smaller than 3 microns. Variation of other measurements can be allowed of no more than 0.3 to 0.5 micron.

The Bryant president knew what he was talking about. Attempts to create machine tools for manufacturing instrument bearings, made at the factory imeni Il'ich in

1959, were unsuccessful. The factory was closer to the preparation of simple grindstones and breechblocks for machine-guns than to the inconceivable precision of instruments.

Bryant could rejoice and not fear competition. It asked vast sums for its outstanding machine tools -- 75 thousand dollars each. Since we needed hundreds of machine tools, the bill came to millions of rubles in exchange currency. However, there were also other, non-arithmetical considerations. The Bryant firm, like the SKF firm before, could trade with us but could also not trade -- for political reasons.

This is the way it was at the beginning of the 9th Five-Year Plan and it had to be decided what to do further. Of course, it would have been possible to wait while the natural laws of technological progress led the factory imeni Il'ich and the special design bureau to a higher level. Ten or twenty years? Or as much as was required by the older Western firms? Opinions on the subject were varied and we will omit the heat and conflict and will say only that it was decided to try again to create machine tools.

Take into account that for the long years that passed from the time of the unsuccessful attempt, there occured no breakthroughs of any kind at the factory or in the machine tool building association imeni Sverdlov to which it belonged. And the people there remained basically as before and no one had any technical inspiration.

In short, there was a kind of illogic in that the factory special design bureau for grinding equipment started to design machine tools, and the factory, to produce them. The president of the Bryant firm probably would have contended that this was as simple as two times two, but it was as if participants in this work were breaking the logic of the development of technology, being ruled by their own special logic-- the logic of state necessity.

This logic was possessed both by the former director of the machine tool building association, G. A. Kulagin, and the present director, B. V. Kashurov. Nikolay Aleksandrovich Panichev was secretary of the party committee of the association, then became director of the factory imeni Il'ich, and lived through and surmounted many difficult days there. From here he was sent to study at the Academy of the Economy and at the factory today they speak of him with respect, gratitude, and the hope that he may go further. The post of director went to the chief engineer of the factory, Boris Nikolayevich Taller, who, as they say, grew up in this collective and found himself here. Last month he became the chief engineer of the association.

The chief engineer of the special design bureau, Arkadiy Aleksandrovich Zykov, came here in 1963, when it was clear that the first machine tools created for instrument bearings were unworkable. But soon he was able to preside over the solution of this problem. Engineers K. G. Boykov, V. G. Samarinov, N. A. Gorelik, I. D. Gebel', A. I. Nefedov, and M. Ya. Starkin worked for 15 or more years at the special design bureau. They began to manage groups and sections and to be respondible for important sectors of research and design for machine tools.

Thus, you will not find in this collective any "individual from the outside." It turned out that such an individual was not needed.

"Our work began in difficult circumstances," relates Zykov. "They did not believe that we, the developers, could create our own original machine tools and no worse than Bryant's. And we, the designers, in our turn, did not believe that the factory could make such highly precise equipment. No, this was not skepticism relating to one another's capabilities. We could not in those years risk giving up purchasing imported equipment while we still did not have our own."

They drew an important lesson from this lack of success. It can be formulated thus: "We have sufficient experience and there is no reason we cannot do it." The special design bureau made operational and creative contact with scientific-research institutes, with the 4th and 5th state bearing factories, and with factories where various assemblies and components for machine tools were prepared. They avoided the traditional method of creating equipment -- planning, experimental models, and industrial series. They began at the beginning -- with research in technology and industrial assemblies, and they tried out on the stands everything they found. It was as if they discarded everything that had been done before and followed their own path, simultaneously studying carefully the experience of many of their colleagues.

Theoretically this lengthened the cycle of development but, in practice, it shortened it considerably, because there was the possibility to select the best variant and to act confidently.

Zykov, together with the managers of the factory and the association, were called to the CPSU Central Committee, to the Council of Ministers, and to the State Planning Committee. At the 25th Party Congress and at the drafting of the country's 9th Five-Year Plan, this question among others of state importance was decided: Should we buy machine tools abroad or begin our own domestic manufacture?

Zykov understood: he answered this question not only as an engineer, but he took part in its decision as a communist, as an economic manager, and as a citizen of the country.

The workers of the factory took on a huge responsibility in those days by declaring that we would have our own machine tools and proposing to spend the milliions of exchange rubles for other needs.

It is obvious that such declarations by themselves are not very convincing. Proof had to be more substantial: the machine tools themselves. But by that time they had already begun to take shape; ideas began to be covered with metal; and the creators themselves -- the designers at the special design bureau and the workers at the experimental shop -- more than anyone felt that the matter was coming along.

It was not easy. The work day of the designers, the researchers, the metal workers of the experimental shop became abnormal. That is, they themselves made it that way. There is an expression: "Don't feel sorry for yourself." They also did not feel sorry for themselves. Zykov contracted a heart disease. They forgot prudence and routine and they stayed late at the factory; they gathered at the stand on Saturday. Nothing like this had happened in the collective before, they told me, and the conditions were surprisingly creative and happy, however tense and difficult they were.

Finally, two machine tools were made. Authorities came from Moscow to look over the creation of the Il'ich people. Then, a conversation took place: "Maybe, there is a design here. But however good it is, it still has to be looked at for a while. And can the factory make them by the hundreds? We do not need experimental models made by skilled craftsmen, but series production."

At the factory there soon stood six machine tools: two Bryants, two of the first domestics, and two exact copies of the American ones. They were able to make them in the shops. A specially created commission visited. Stocks of bearing rings were brought in. The machine tools passed the test. All six worked. Our first models rivaled the foreign ones and did not lag them.

We still did not think about victory or about surpassing Bryant. It is true that we felt that a breakthrough had begun during the 10th Five-Year Plan, despite the natural laws of technology. The cautious commission made a rare decision: they considered it possible to permit trials for domestic machine tools. Thus, the real trials lay ahead.

And there was another historic day: On 3 March 1976, delegates to the 25th CPSU Congress approved the Basic Directions for the Development of the USSR Economy for 1976 to 1980. In this document, several lines were devoted to the dramatic and complicated situation that we are talking about: "To develop the bearing industry, especially the production of special-instrument and precision bearings . . . To bring about the construction of factories for highly precise machine tools for instrument bearings."

At a meeting of communists of the factory imeni Il'ich, these lines were discussed in particular. The secretary of the party bureau, Vladimir Ivanovich Yakovenko, then repeated: "This has been written about us. This is our task."

Why, the Il'ich people had set this task for themselves and they had to accomplish it themselves. Of course, they had received assistance, but they also were able to think like proprietors. They did not undertake the matter for the sake of prestige but for the good of the state.

With many difficulties, which meant doing it by hand, during the span of two years, 1975 and 1976, ten machine tools were prepared at the factory -- the whole gamut of equipment for manufacturing instrument bearings. The yearly demand for them in the country was greater by a factor of ten or twenty. Mass production of such items was required that would exceed the precision and complexity of clockwork and would require no less cultivation of production.

"We put together a 'blue book'," related Boris Nikolayevich Taller. "This was a plan for measures that had to be taken in each plant and shop. Half of the success, according to general opinion, had to be in providing equipment; the other half would be highly qualified people. Well, the ministry helped us with the equipment; it allowed 400 thousand rubles for this. They made an addition to the heat-constant shop; this was another three million. Moreover, there was a need for the most precise instruments. We had only talked about microns, but now we had to see these microns and control them."

The most complicated part was that of personnel. In our experimental shop worked such metal craftsmen and fitters as Andrienkov, Volkov, and Rodionov, who could work with the assembly and testing of new machine tools, but tens of similar workers were needed.

Do you know what we did? Essentially, a new assembly shop was created, and the new head, Yakov Ivanovich Borodulin, was given a list of workers in the factory and was told: "Write down the names of those that are needed and take them." Additional criteria were formulated that were used to choose the assembly workers. They should be young people with secondary education, with even temperament, tolerant, and so forth. People were needed without work habits, so that they could become accustomed at once to microns as microns. Older assembly workers who had worked many years with "hundredths," could spend a long time in coming around to micron tolerances and some of them could not do it at all.

There was still more training, of course, and not only technical. Teams were created, and this was a great help in establishing the rhythm of discipline and the cultivation of production. Then, the testers dressed in white smocks. They started in time to wash their hands. Do you think this is an odd detail? No, for us this was an achievement which reflected the change in qualifications and in the psychology of the whole collective.

For several years, the factory collective fulfilled completely all that was written down in the "blue book: and accomplished all of the large and small tasks that, in the final analysis, came to those few lines entered into the documents of the 25th Congress. Each worker was confronted with the necessity of making one decision or another. For the factory managers, one of the most difficult tasks arose at that moment when the series production of new machine tools was to begin and, according to calculations, it came out that there was insufficient factory capacity for rapid expansion of their production. Then, it was decided to curtail the production of wheel-grinder machine tools and transfer them to other factories of the same industrial sector.

For the Il'ich workers this was profitable production: a completed model, a cooperative arrangement, the Mark of Quality, and a large number of orders. They said to the director: "Let well enough alone." But he looked for ways to solve what seemed insoluble problems.

A turning point was reached. In 1977, the factory prepared 53 machine tools. A problem in the manufacture of instrument bearings at the 5th state bearing factory was completely solved. In 1978, industry received 209 machine tools, and in 1979, 234.

Victory came unnoticed. Perhaps it was because there was a perceptible ponderousness and constancy in it. You feel this victory today in the shops of the factory imeni Il'ich, in the features of the productive life of the collective that have already become habitual and prosaic.

The shop chief, Yakov Ivanovich Borodulin, exhibited a number of machine tools. The assembly of some was being completed, others were being tested, and a third group were being prepared for shipment. "See how our shop was from the beginning until now," he said, "then look at this line . . . Here, everything has been altered or rebuilt."

Yuriy Alekseyevich Volkov who, together with the designers, tested the first assemblies on the stand and who now manages the assembly team, spoke enthusiastically of the machine tools as if he had seen them for the first time: "Look, what beauties! They take up less space than the American ones by a factor of one and a half. Of course, it isn't easy to put them together but, before, it took us up to twenty days on each one and, now, it takes just a little over a week."

Viktor Mikhaylovich Rodionov, a man of few words and unhurried movements, was on the verge of explaining the details of machine-tool testing, but gave up with a shrug, pointing to a stack of documentation: "They say that everything is written down. There are micron tolerances at each point of the testing program."

Team leader of the assemblers, Anatoliy Ivanovich Boyev, spoke with conviction: "No, we have achieved machine tools better than the American ones. We went over everything with our own hands and we had a good feeling for what would work and what wouldn't. Besides, take the rounding out of sets: for the first of our models we used foreign sets -- this took 25 thousand rubles a set; think how much money! But now everything is ours, made in our country. Cheaper and just as good. We still have not received a single complaint for any of our machine tools.

One could make a long list of technical innovations that have been applied by the designers of these machine tools and that the workers of the factory imeni Il'ich have embodied in metal of the highest quality. However, then came special terminology. Let us say, for example, that ultrasonics are used in grinding, that progressive materials such as "elbor" are used here in reducing friction in especially vital assemblies, and that the most precise feed mechanism for instruments has been created. This machine tool contains about 20 inventions. This is what is stated in one of the documents: "In identical output of machine tools (ours and American) the precision of items manufactured on domestic machine tools is greater by a factor of one and a half to two."

But in the shop there already stands a machine tool, assembled, tested, and with proven outstanding results, which is already twice as productive. It operates simultaneously on two rings for bearings.

Suddenly, it has turned out that equipment created at the factory imeni Il'ich has hidden reserves. However, this also follows a natural law, insofar as the Il'ich workers have not simply created new machine tools but have broken into the world of microns, accomplishing a most complicated task and, at the same time, have accomplished a large number of other things of particular character.

The very high precision of automated machine tools has interested workers of the instrument industry. Is it possible to grind a drill with a diameter of a millimeter of less? It turned out that it was possible. A little modernization, and the machine tool was ready that could grind a drill with the thickness of one tenth of a millimeter.

Specialists from another industrial sector came with a proposal to develop very small components of ceramics. They tried to do it and the results are hopeful. At bearing factories, it has been seen that there are many more possibilities for new equipment than has been shown on the surface and they have begun to fit it for manufacture of a wider variety of items. But the designers of the factory Il'ich, even with some amazement, recognize how many and how good the pioneers can make them.

We understand that the technical details of this work will not fascinate and stir up every reader. But transport yourself in thought to five years back, after recalling the few lines of the task formulated at the 25th Congress. Imagine the people who were, in those days, anxiously thinking over the state plan of our country. Imagine the shops of a machine-building factory on the Vyborg side of Leningrad, where it was not even possible to guess the coming changes. And now, when you know what has happened during these five years at the factory imeni Il'ich, think about this figure: to satisfy the need of the country for machine tools for instrument bearings under the 10th Five-Year Plan that is now ending required over 215 million exchange rubles.

We will manage with our own efforts. In five years, over 700 unique machine tools have been made. Leningrad machine-tool builders can report on this with honor and pride at the 26th CPSU Congress.

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GLEBOV'S, KOTEL'NIKOV'S SUPREME SOVIET COMMISSIONS CRITICIZE MINISTRIES FOR 'TIMIDITY' IN INTRODUCING NEW TECHNOLOGY

Moscow IZVESTIYA in Russian 19 Sep 80 p 3

[Article by V. Mussalitin: "To Create Rapidly and to Apply Successfully"]

[Text] The country has started a shock watch in honor of the 26th Party Congress. Every day, in newspapers, radio broadcasts, and television we learn of new labor achievements. We know that the basis for the successes of advanced collectives consists of knowledge, experience, skill, craftsmanship, and bold use of advanced, progressive methods and various technical innovations.

Some examples. The collective of the largest production association in Lithuania, the association imeni Yu. Vitas, decided on product output in five years of over 80 million rubles above the plan. The rate was based on the effectiveness and the quality of labor. In four and a half years, 158 technical and organizational innovations were introduced, which lent reality to the high commitments. Again in Vil'nyus, a threefold growth in production volume has been achieved at a drill factory during a ten-year period through complex mechanization and automation.

This is what is meant by workers' skills and innovators' inquisitive minds! It is not accidental, therefore, that Comrade L. I. Brezhnev, in addressing the subject of inventors and rationalizers, stressed that the Communist Party assigns great significance to their activities because the results of inventors' and rationalizers' activities, multiplied by the shock labor of the Soviet people, opens up new reserves for raising the effectiveness of civil production, the growth of labor productivity, and improvement in the quality of products.

The USSR Supreme Soviet in its practical activity gives continuous attention to the problems of scientific-technical progress. At a joint session of the commissions on science and technology of both the Council of the Union and the Council of the Nationalities that was held on 16 September in the Kremlin, there were discussions of the utilization of inventions and rationalizers' proposals in associations, at enterprises, and in organizations of the USSR Ministry of the Machine Tool and Tool Building Industry, the USSR Ministry of Chemical and Petroleum Machine Building, and the USSR Ministry of the Electrical Equipment Industry.

The session was led by chairmen of the commissions, I. A. Glebov and V. A. Kotel'nikov. There was participation in the session by Deputy Chairman I. B. Usmankhodzhayev of the Presidium of the USSR Supreme Soviet, Secretary M. P.

Georgadze of the Presidium of the USSR Supreme Soviet, and managers of ministries and agencies.

A large, exciting discussion, as always, was preceded by careful preparatory work. The deputies became acquainted with the utilization of inventions and rationalizers' proposals in several associations, enterprises, and organizations from Moscow and Leningrad and examined the situation in a number of union and autonomous republics and oblasts. The commissions also requested materials from the USSR State Planning Committee, the State Committee for Science and Technology, the State Committee for Inventions and Discoveries, the Committee of People's Control, the Ministry of Justice, the Central Council of the All-Union Society of Inventors and Rationalizers, and other ministries and agencies.

A report was presented by V. A. Zgurskiy, the leader of the joint preparatory commission of deputies and chairman of the exedutive committee of the Kiev City Council of People's Deputies. Reports were also heard from A. K. Antonov, the USSR minister of the electrical equipment industry; K. I. Brekhov, the USSR minister of the chemical and petroleum machine building; and N. I. Sergeyev, deputy USSR minister of the machine tool and tool industry.

In the report, in the announcements, and in the speeches, it was noted that these ministries conduct definite work on the development of highly effective technical solutions and the introduction of their results into production and on raising the technical level and quality of product output. This work was especially activated after the adoption of the well-known decrees of the party and government directed toward the further development of invention in the country and the wider utilization in the economy of discoveries, inventions, and rationalizers' proposals; improvement in planning and strengthening of the influence of the economic mechanism for raising the effectiveness of production and work quality.

The deputies were happy to hear that the effect from introduction into these sectors of new technology and equipment during the four years of the five-year plan was around a billion rubles! There is no denying that this is good. And there are new designs for metal-cutting machine tools with numerically programmed control, complete equipment for factory automation for the manufacture of automobile pistons, highly precise machine tools for making instruments, and tools from synthetic diamonds, and the first applications in the world of complexes of equipment for extremely long lines for electrical transmission of direct and alternating current.

But the sense of the work of the permanent commissions is to give attention to unsolved problems and substantial shortcomings and to outline ways for swift solution. This is explained in the deep concern that was heard in the speeches of deputies Ye. K. Ligachev, Ya. Ya. Vargis, and P. A. Solov'yev. They criticized the ministries for being too timid in including tasks in the plan requiring the assimilation of hardware, materials, and technological processes created from inventions recommended by the State Committee for Inventions and Discoveries and, even more, for not finding worthwhile applications for the innovations created within their own economic sectors, to say nothing of those that have appeared in other agencies, academy of sciences institutions, and higher educational institutions.

Deputies L. N. Nersesyan, B. A. Arbuzov, V. F. Tolubko, and S. R. Rafikov, in their presentations, said that the ministries lack the needed persistence in work on renewing the variety of products from the utilization of inventions and highly effective rationalizers' proposals, that they still are insufficiently demanding toward the activities of their subordinate scientific organizations, and as the result of which the developments under way often do not correspond with current technology levels. Also, the fact that many associations, enterprises, and organizations still do not have experimental bases or sections constrains the utilization of inventions and rationalizers' proposals substantially.

It was often stressed at the session that an important role belonged to creative civil associations, to design and patent bureaus, and to creative complex teams. One mind, as is known, is good, but two are better. The effectiveness of a proposal developed by a creative complex team is significantly greater than that usually made by an individual inventor. The experience of the Vladimir electric motor factory and others are very convincing on this point. Nevertheless, despite the obvious advantage that civil creative associations have, at many enterprises there is no hurry to create them. Though they undoubtedly have done good service at the Gagarinskiy factory "Svetopribor," the Rybinsk cable factory, and the Brasovskiy machine-tool factory, and, in fact, at many other factories. But the whole trouble is that, as the deputies noted, the administration and councils of the All-Union Society of Inventors and Rationalizers at associations, enterprises, and organizations are still weak in attracting civil creative collectives to the elimination of bottlenecks.

The deputies frequently accented the activities of the patent units and bureaus for rationalization and inventions. They expect much of these units, but their output thus far is small. This is explained, among other things, by the small number of such units. For example, at the Tambov factory "Polimermash," work on inventions and rationalization occupies only one person. It is the same at the Sverdlovsk oxygen machine building factory, the Barnaul apparatus and mechnical factory, the production association "Uralkhimmash," and many other enterprises, with whose work the deputies happened to become acquainted. Often, in addition to their direct obligations, an engineer at a bureau for rationalization and inventions has to do things that lie far off the course of his basic work. It also happens that work on inventions and rationalization looks like make-work and an extra burden to some worker.

In the opinion of the deputies, further improvement is needed also in the system of financial stimulation for creating and introducing inventions and rationalizers' proposals. Meanwhile, the system has a number of groundless limitations. Sometimes there is lack of order in payment of awards for assisting with inventions and rationalizations. In the speeches of deputies N. A. Borisovich and A. G. Babayev were proposals relating to the necessity for more rational use of resources allotted to scientific research projects.

The commissions recommended that USSR ministries and agencies adopt the measures necessary for eliminating shortcomings and to develop and implement measures that would aid in increasing the effectiveness of exploiting inventions and rationalizers' proposals and would require the strengthening of responsibility for creating and hastening the introduction of new techniques and progressive technology for which the bases are inventions that have important economic significance.

The session also heard a report by the USSR State Planning Committee and the USSR State Committee for Science and Technology on the financing of scientific research outlined in the draft of the 1981 State Plan for the Economic and Social Development of the USSR.

9645
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PATON INSTITUTE AS MODEL FOR ACADEMY BRANCH RESEARCH COOPERATION

Moscow EKONOMICHESKAYA GAZETA in Russian No 40, 1980 p 16

[Article by V. Fartushnyy, director of the All-Union Planning and Design Institute of Welding Production, Kiev: "In Alliance with an Academy Institute: A Scientific Research Institute and a Design Bureau Under New Conditions"]

[Text] Very often when people talk of relations between science and production or aid to technical progress, they use the example of the Institute of Electric Welding imeni Ye. O. Paton. As partners, it has tens of factories, design bureaus, and ministerial scientific research organizations.

As is known, this institute is part of the Ukrainian Academy of Sciences and is engaged in fundamental research. At the same time, it energetically assists in the practical realization of new scientific ideas. Such an approach is in accord with party and state measures for improving the economic mechanism, in which stimuli to scientific-technical progress are foreseen.

At the present time, it seems important to determine more clearly the organizational forms for mutual relations between ministerial and academy institutes. One of the preferable variants could be joint work on long-term programs.

I shall cite the experience of cooperation between our All-Union Planning and Design Institute of Welding Production (Kiev) and the Institute of Electric Welding imeni Ye. O. Paton. We are designing and introducing mechanized means for welding production into industry. In addition, we are working on raising the technical level for forge-stamping production at factories of the instrument industry (our institute belongs to the Ministry of Machine-Tool and Tool Building Industry). Not long ago, we were faced with the task of creating effective welded structures for metal working equipment and to assimilate them into industrial manufacture.

In connection with this, a program was adopted for joint work by the academy institute and the ministry institute. In the program were included problems for the development and introduction of and techniques for contact joint welding with pulsed fusing, friction welding, electron beam welding, application of electroslag remelting for repair and preparation of stamping equipment, industrial production of stocks by means of electroslag casting and welding, union of welded structures, and others. Enlisted in fulfilment of this program were the Institute for Electric

Welding imeni Ye. O. Paton, with its large scientific-research and experimental base, and a number of ministerial scientific-research institutes and all-union industrial associations.

In our opinion, this is one of the progressive forms of mutual relations between academy and ministerial scientific research institutes. In this given instance, it is still early to speak of concrete results; the work on the program began just a few months ago. But we are convinced that it will be crowned with success.

It is interesting to find out how contacts with academy institutes influence the level of research in the industrial sector. At one time, ministerial scientific research institutes were asked to cut down the gap between "pure" science and "pure" production, that is, to hasten the process of introducing scientific achievements into production. These functions are still with us today.

At the same time, they are ceasing to play the role of a simple transmission system. Many scientific research institutes have grown stronger and their equipment and instruments permit the conduct of research at a high level. Many have acquired experimental plants (we have one in our institute). Recently, we created a complex of mechanized lines for assembly-line production of all-metal four-axle gondola railway cars at the Uralvagonzavod. The complex will provide an economic effect of over a million rubles.

We can also talk about the automatic line for manufacturing latticed flooring used in construction. The line was installed at the Magnitogorsk plant for metal construction. The institute's assets include a complex line for assembly and welding of basic assemblies for the Chelyabinsk tractor.

Whereas academy institutes are asked basically to work on long-range projects and give their attention mostly to fundamental research that determines the future situation, ministerial scientific research institutes are oriented toward satisfying the current questions of technical progress. Having had long ties with the Institute of electric Welding imeni Ye. O. Paton, we consider subjects in our long-range plan that are laid out in long-term programs and are being done jointly. Now, for example, we are working on the problem of converting impractical manufacture of casting and forged stocks to a welded operation.

The term "project planning" we understand in the broad sense of the word as the process of research and pre-project development, laboratory testing, experimental-design and technological work, the building of experimental models, and so forth. This now takes place within the framework of a new system of planning, financing, and economic stimulation for scientific research institutes.

It is not uninteresting to introduce certain data on the improvement of output from the scientific research institute for the year of cooperation with an academy institute. The economic effectiveness from introducing developments increased by 38 percent. Last year, through the use of equipment created in the institute, a savings of 5 million rubles was achieved.

Earlier, we frequently came upon difficulties when an innovation was developed, even in a short time, as in utilizing an invention, but practical utilization of it was held back for a long time. I will not say that this very important problem has been solved. However, things have gotten better since our institute together with organizations of the Ukrainian Academy of Sciences have been participating in continuous planning. The system created provides the possibility of examining the whole route from an idea to its introduction into production and practically excludes unrealized topics.

It is still too soon to speak about the final success of the experiment, although the experience is reassuring. In the process of putting together the joint subject plan, ties between the academy institute and the ministerial scientific-research institute and experimental plant have been strengthened.

Thorough working of each stage permits more precise determination not merely of the length of research periods; at the experimental plant, they know the time frames for starting production and manufacturing of one machine or another.

Practice has shown that much depends on the economic preparations of technologists and designers. Comparing expenditures and results at all stages of development of new technological processes and equipment, we obtain the cost estimate both of the technology itself and of the machine.

And here we come across a problem, the solution of which is still beyond our reach. I am speaking of the complicated practice of estimating the cost of project planning. Essentially, it denies the possibility of fulfilling the plan with a lower cost than what had been planned. For us, this has become a substantial obstacle in the utilization of existing reserves, especially under the conditions of cost-accounting.

Evidently, the question of creating normative documents which determine the cost of research and designed developments has come to a head.

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ROLE OF R&D FINANCING IN SPEEDING UP INTRODUCTION OF NEW TECHNOLOGY EXPLORED

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[Article by V. Babak, candidate of economic sciences, V. Logachev, and V. Dvoryashin: "The Most Important Ways to Hasten Developments of New Technology"]

[Text] The reduction of scientific-research and experimental-design (SRED) time is one of the basic conditions for hastening the introduction of the achievements of scientific-technical progress into production. In achieving this task, an important place is allotted to the development of norms for the duration and cost of SRED work.

The significance of norms for duration and cost of SRED is growing while the volumes of expenditures for such work must be determined in five-year plans (with yearly breakdowns) in percentages of the volume of production of the economic branch (standard net or commodity), and the wage fund for scientific workers, in percentages of the volume of expenditures for SRED. In order that the establishment of dependence between the size of the economic sector's production, the volume of SRED, and the wage fund can aid the shortening of work time, it is necessary, in our view, to consider the following situations.

First, the total volume of SRED planned for one economic sector or another includes both work being done for that sector and inter-sector work, the most important of which is done by cooperation with scientific research institutes (NII's) and design bureaus (KB's) of other sectors in accord with complex programs. So long as the amounts of SRED are dependent on the growth of production of the given sector, there is an interest on the part of the ministries to give first priority to the fulfillment of intra-sector work at the expense of inter-sector work, unjustifiably increasing the duration of the latter. In order that the development of cost-accounting in economic sectors not hold back the introduction of the program-goal method of planning and managing scientific-technical progress, it would be advisable to separate inter-sector work from the total volume of SRED being done by sector NII's and KB's and to finance them out of budget allocations.

Secondly, the process of specialization and cooperation in the sphere of scientific-technical progress exerts influence on the duration of SRED work. As a result of this, first of all, in many sectors the proportion of salaries in expenditures for SRED declines with the simultaneous significant increase in the volume of work done by outside organizations and enterprises.

Thus, in the electrical engineering industry, the amount of actual expenses for SRED has increased over 10 years by 119.6 percent, but wages by only 68.6 percent, with a growth by a factor of 6 in outlays for payments for work done by outside organizations and enterprises. As a result, the proportion of wages in SRED expenditures decreased in this period from 40.4 percent to 30.5 percent, and the amount of outlays for work by outside organizations rose from 13.3 to 37.2 percent. It is important to note that during the 10-year period there was a yearly saving in wages, whereas in outlays for work by outside organizations, real expenses have exceeded those provided by the plan and estimates by 27 to 122.4 percent. Consequently, the savings in the wage fund were achieved not by raising labor productivity but by transferring part of the work to other organizations and were actually absorbed completely by increases in expenditures for wages at these organizations. We therefore consider it necessary to introduce indicators for NII's and KB's for conduct and submission of work done through their own efforts. Then, the planning of wage funds and control over their rational utilization will aid the growth in labor productivity of NII and KB workers and the fulfillment of work in shorter periods.

In industrial sectors, there are very diverse correlations between many NII's and KB's and the production possible by those and others, and also between many head institutes and specialized scientific organizations; and they seldom correspond to the needs of the sector. A substantiated increase in the number of head institutes (for example, from 18 to 22 in the Ministry of Electrical Equipment Industry), caused by expansion of trends in the technical development of the sector, are usually accompanied by an overall growth in the number of NII's and KB's, which does not permit the concentration of resources or the reduction of SRED time. In machine building, a shortage is being felt in design and technological development which constrains the timely use of finished applied research.

The number of scientific organizations and the correlation among their various types are very dynamic; they change from year to year; and new organizations are created; but there is virtually no management system which allows the determination of mutual relations among them and the place of each in the solution of problems for raising the technical level of production and the quality of products. A deepening of the process of specialization and cooperation in scientific developments is now taking place which, unfortunately, is not always accompanied by their concentration, and this leads to growth in the number of small scientific organizations. Thus, in the Ministry of Electrical Equipment Industry during three years of the 10th Five-Year Plan, the number of NII's and KB's increased by about 15 percent, while the growth in the volume of SRED work done, according to estimated cost, was only 12 percent and, according to actual cost, 15 percent, but only 4 percent was completed and handed over to ministries and consumers. In consequence of this, according to the calculations of one organization, the volume of work completed in one year did not increase, and the volume of work turned over to ministries decreased by 10 percent. An increase in the number of scientific organizations is taking place also in the Ministry of Machine Building for Light and Food Industry and Household Appliances, the Ministry of the Automotive Industry, and a number of other economic sectors.

When they are co-performers on large projects, small organizations lengthen the time it takes for work to be completed, as the result of which, uncompleted production is growing at head institutes. Uncompleted production at NII's and KB's of a number of economic sectors already approaches two years' work and, at individual institutes, exceeds that amount. Thus in the Ministry of the Electrical Equipment Industry, at the end of 1978, it reached 178 percent of the yearly volume, whereas at the end of 1969, it had been only 5 percent. During a ten-year period, the yearly volume of SRED work fulfilled increased by a factor of 2.1, but the uncompleted production, by a factor of 3.5. In this connection, the proportion of uncompleted production of projects financed from the Unified Fund for the Development of Science and Technology increased from 32.3 percent on 1 January 1969 to 59.4 percent on 1 January 1979, but with projects fulfilled on the basis of contracts with requestors, there was a corresponding decrease.

The reason for this situation is the increasing complication of new engineering and technology that requires increases in expenditures of time and resources on its development and assimilation. First of all, this pertains to projects being done according to the state plan and ministerial plans and being financed by the Unified Fund. Hence, the Ministry of Electrical Equipment Industry annually planned for outstripping rates of growth for SRED financed from the Unified Fund and, accordingly, increased the share of such work in the plans of NII's and KB's of the economic sector. As a result, in the SRED plan for 1978, the volume of work financed from the Unified Fund increased in comparison with the plan for 1979 by a factor of 2.9, but the volume of work for requestors increased by a factor of 1.7, and the proportion of the first, according to the estimated cost was 62 percent as against 49 percent.

Thus, one clearly observes the policy carried out in the economic sector as the planned relative reduction of SRED done under contracts with requestors, with the aim of concentrating NII and KB efforts on projects being done under the Unified Fund and of fostering their speedy completion.

However, the fulfillment of plans for these two types of projects went differently: in the case of projects done for requestors, the plans were significantly overfulfilled every year and the output of work exceeded its planned volume, whereas in the case of projects done under the United Fund, plans were overfulfilled only up to 1973 (although to a significantly less degree than for contract work), but they were not fulfilled after that. It is still worse in the case of the submitting of work done under the United Fund, which for a whole ten years has been significantly less than both planned and actual fulfillment. Consequently, the volume of work done under the United Fund increased in 1978 against 1969 by less than a factor of 2.7, but uncompleted production, by a factor of more than 5.2. Uncompleted production also increased with respect to work done for requestors, despite the fact that submission of this work exceeded yearly the planned volume because of significant overfulfillment of the plan.

Such a situation, in our opinion, comes about, first, as noted above, because of the definite lack of correspondence among the capacities of separate SRED co-performers under conditions of the application of a single commission-order, which causes delays in the work by head institutes.

Secondly, among many organizations, there has been an increase in the number of projects being worked on simultaneously, which does not contribute to the concentration of efforts and resources or to shortening SRED time. In the All-Union

Scientific Research Institute for Thermal Electrical Equipment for four years of the 10th Five-Year Plan, the quantity of projects being worked on annually grew by a factor of 1.5, with an increase in the volume of these projects, according to an estimate of cost, of 18 percent and, according to real cost, 22 percent. Fulfillment of projects through the efforts of this organization itself lagged the general growth in volume of SRED work, as a result of which the proportion of such work, according to estimates of cost, decreased from 73 percent in 1976 to 69 percent in 1979, and, according to actual cost, still more, from 72 percent to 67 percent, respectively.

Thirdly, in the subject plans for NII's and KB's, quite often changes are made during the year that are caused by shortages of supplies and equipment and by other things, as a result of which one subject or another is transferred from one year's plan to the next, and expenditures for its fulfillment continue to grow; often projects are discontinued and expenditures are realistically recognized as not worthwhile, but often they are not immediately written off and are listed for a long time as uncompleted production. In the Ministry of Electrical Equipment Industry in 1978, a relatively large sum was spent for Unified Fund projects that were withdrawn and written off production, although from 1969 to 1977, it was insignificant. At the same time, for projects done on order for requestors, such write-offs were made twice: in 1974, almost 2 percent of the volume of submitted work and, in 1977, about 1.6 percent. All together, from 1969 to 1978, the amount of work done on order that was put down as withdrawn exceeded that done under the Unified Fund by a factor of 3. Insofar as, on the whole for the ten years, the proportion of expenditures on projects done on contract and submitted to the requestor makes up about 55 percent, one can conclude that in the composition of uncompleted production done under the Unified Fund, there was accumulated a significant amount of expenditures subject to write-off for work withdrawn from production.

Fourthly, projects done under contract for requestors are more profitable, which causes NII's and KB's to strive toward first-priority fulfillment of a large number of them and toward increasing their number. As a consequence of this, on the one hand, the time spent on Unified Fund work is retarded and, on the other hand, the length of time spent on contract work is increased, because organizations seek very much to accumulate them and do not rush to complete them.

Analysis shows that in the Ministry of Electrical Equipment Industry from 1969 to 1978, the reduction of actual expenditures as opposed to estimated expenditures in the cost of contract work was significantly larger every year than that for work done under the Unified Fund, and, on the average for the ten years, the difference in levels of expenditures on them was 5.8 percent of the estimated cost of submitted work. This was caused by a higher demand by the ministry on the NII's and KB's that were included in the estimates for work to be done and on the control, on its part, of the level of expenses and accumulations, whereas in work for requestors the estimated cost systematically went up substantially, which has a negative influence on SRED time. An analogous situation is found in the Ministry of Heavy and Transport Machine Building and Ministry of Power Machine Building.

Profit is not planned for NII's and KB's and, in distinction from enterprises and other organizations (for example, planning-design organizations doing work on capital construction), evaluations of their activity are not derived from the fulfillment of a profit indicator, and this has led largely to the absence of a standard base for pricing SRED developments. The accumulations of funds found at NII's and KB's from differences between estimated cost of work and actual expenditures for its fulfillment, as practice shows, often appears to result in raising estimated cost rather than in the economy of resources.

In connection with the fact that the growth of accumulated funds at these organizations rarely demonstrates improvement of their work and cannot serve as a criterion for evaluating the effectiveness of NII and KB activity, a procedure recently has been established for more precision in estimating the cost of completed work, which cannot exceed actual expenditures for SRED work by more than 3 percent. The difference between the earlier established estimate and the refined estimate of costs will be turned over to the reestablishment of a source for financing those projects for which it was formed. Such a procedure must exert a restraining influence on raising the cost of work, especially that being done under contracts with requestors; such influence will allow NII's and KB's to overfulfill plans by changing the planned structure of work and to deduct (assign) significant sums to the organization's development fund. As a result, the quantity and time-cycles of SRED work can be reduced.

A negative influence on the length of working time and the growth of uncompleted production has been exerted by the absence of its standardization and the development of working funds, which until 1977 were approved only for production reserves which make up about 4 percent of total working funds. The size of these standards had practically no influence on the financial position of NII's and KB's. At the same time, the rest of the uncompleted production of SRED work, which makes up the major portion of working funds, have not been standardized and there has not even been a methodology for standardizing working funds that take into account the specific activity of ministerial scientific organizations.

With the aim of shortening SRED time and reducing uncompleted production in the electrical equipment industry, a methodology was developed for standardizing the working funds of NII's and KB's. It provided for definite reduction in actual residues of working funds and also introduced detailed accounting of standards for working funds in uncompleted production separately by projects done under the Unified Fund, under order-commissions, and under contracts with requestors of the same economic branch or other ministries and agencies. For each of these types of work, coefficients are established for changes in actual residues of uncompleted production, which are applied in the following manner: if the average yearly residue of uncompleted production does not exceed 100 percent of the planned volume of work, the coefficient is one; for a level of residual from 101 to 125 percent, it is 0.99; and from 126 to 150 percent, 0.97, but over 150 percent, 0.001 is added to the 0.97 coefficient for each percent of increase.

The introduction of such standardization, in our view, will have hardly any substantial effect on lowering the need of NII's and KB's for working funds. In our opinion, for well-grounded standardization of uncompleted production, NII's and KB's must bring about either a one-time cardinal restructuring of SRED planning by shortening work time and concentrating efforts on a limited number of high-priority developments, or annually reduce the volume of uncompleted production based on clearly defined reference points established on the basis of progressive standards for work schedules, costs, and the quantity of projects being done simultaneously that must be achieved during the established period. However, the methodology referred to is not directed toward cardinal restructuring of the activity of ministerial NII's and KB's, and its development must be looked upon as only a step in the development of standardization of working funds for these organizations.

The effectiveness of economic levers and stimuli in the field of SRED depends, in our opinion, on the extent of their being tied to improvement in the system of management for scientific-technical progress in the economic sectors, optimization and reduction in work time for scientific research and development, and the establishment of standards for each type and stage of work. It is important to stress that extended work periods for conduct of SRED often brings to naught many years of effort by large collectives of developers in that the engineering and technology created by them turns out in the end to be obsolescent.

In this connection, it is inadmissible to have artificial subdivisions of projects; reduction and optimization of work time must be achieved by concentrating meaningful efforts of developers on a limited number of large, complex projects. The determination of standard work times for conducting SRED and the planning, on this basis, of the volume of necessary work will be aided by the optimization of networks of NII's and KB's within economic sectors and will create conditions for their consolidation and greater flexibility in fulfilling projects. Then, sound standardization of their working funds can be introduced, and these organizations can be allotted their own working funds. It seems that after optimization of work time for project completion, the introduction of measures for improving their planning and orderly fulfillment and also the transition to accountability for fully completed work for ministerial NII's and KB's will be sufficient to allot them their own working funds at a level of 10 percent of the volume of SRED work so that the rest of the volume can be realized on the basis of bank credit provided, not on the basis of plans, but on the actual fulfillment of a volume of work and planned completion periods. Amounts of credit must be determined and provided to NII's and KB's with consideration of their having their own working funds.

Our proposal is supported by the experience of project and exploratory organizations which, at the beginning of the 9th Five-Year Plan, were transferred to accountability for finished products and stages of work. In the process of applying such accounting, the pay for finished projects, explorations, blue prints, and other types of finished work received increasing distributions. The share of such accounts at 40 Khar'kov project organizations for finished products realized by the requestors situated in Khar'kovskaya Oblast, for the last five years, constituted, on the average, 70 percent. As a result of improvement in organization and reduction of work periods, there was a sharp decrease in the volume of uncompleted production -- 50 percent of the yearly volume of fulfilled work achieved under the 8th Five-Year Plan. In the period from 1973 to 1978, uncompleted production at the end of each year equalled 12.3 to 12.5 percent of the work fulfilled that year, and the standard for organizations' own working funds for these expenditures set at the level of 15 percent of the yearly volume of work, turned out to be too much.

An analogous situation arose among project organizations in six machine-building ministries (the Ministry of the Electrical Equipment Industry, the Ministry of Instrument Making, Automation Equipment, and Control Systems, the Ministry of the Machine Tool and Tool Building Industry, the Ministry of Machine Building for Light and Food Industry and Household Appliances, the Ministry of Chemical and

Petroleum Machine Building, and the Ministry of the Automotive Industry). With the transition to accountability for the realization of project production and stages of work, uncompleted production rose some at the beginning and then, in the 10th Five-Year Plan, began to lessen and, at the beginning of 1979, was 9.3 to 15.1 percent of the volume of project-exploratory work during 1978. It is characteristic that the dynamics of these project organizations' having their own working funds corresponded to changes in the volume of uncompleted project-design production and the need for them in the last few years has acquired a steady tendency toward reduction. Ministerial project organizations regularly use bank credit for expenditures for uncompleted production and on accounting documents along the way. Here, undoubtedly, is an effect of the credit-accounting mechanism on the reduction of work time and on the reduction of uncompleted production.

For the reduction of SRED work time, along with the creation of a rational network of scientific-research, design, and technological organizations that provides economically sound cooperation and simultaneous and parallel fulfillment of stages of large projects in short periods, the development of an experimental base has great significance. It is important to provide rapid introduction of experimental production and the up-to-date equipment and instruments necessary for this purpose, and to reduce the number of developments coming to the experimental base by consolidating topics at head NII's and scientific-production associations. Experimental plants must also be freed from fulfilling orders that do not correspond to their missions, particularly for series production. For this it is advisable to subordinate them to head institutes of corresponding type and to establish indicators for the evaluation of their work, on the basis of which there can be tasks set for development, assimilation, and introduction within short periods, of highly effective types of engineering and technology.

In order for NII's and KB's to participate more actively in the assimilation of their developments into production and in the rapid expansion of product output, it is advisable, in our view, to include in the volume of expenses and to stimulate, not only fulfillment of SRED work itself, but also the conduct of such projects as final adjustment of new technology and engineering at enterprises; the further aid and adjustments in the assimilation of its production; cooperation with the users of the technology in their plants, testing, and putting it into operation; and the organization and expansion of serial production. Of course, different approaches are needed here, with consideration for the peculiarities of each economic sector and status of production in which the scientific developments are being introduced, their technical level, and personnel qualifications. In particular, on-site cooperation with users of new technology, testing, and starting operation in a majority of economic sectors is done by specialized maintenance organizations and, in some, by experimental plants. However, the need for participation by NII and KB workers in fulfilling such work and aiding its most rapid completion, often arises and it must be quickly satisfied.

Recently, there has been an increase in the number of enterprises and associations that have decreased significantly the lengths of time for introduction of new engineering and technology resulting from raising the effectiveness of production management and aiding workers at NII's and KB's. In the Scientific Research Institute for Basic Chemistry, for example, there are special teams for introduction composed of researchers, designers, and specialists of industrial enterprises, and standards were created for fulfilling work in correspondence with the subject matter of the institute. This permitted the reduction by a factor of two of the industrial assimilation time for developments.

In the all-union scientific-production association "Soyuzgazavtomatika," rich experience has been accumulated over the last seven years on the organization of complex creative teams, which include all participants in the research-to-production cycle and which submit finished production to requestors in compressed periods. Reduction in SRED time is being achieved because all of the teams occupied with creating new forms of technology work in parallel from the beginning of the constructive study of an idea to its introduction into production. The teams are linked together in an organizational chart. Relationships among co-performers are brought about through economic agreements. Under such conditions, it is possible to organize continuous planning of the process for creating new technology. Effectiveness in utilizing resources is raised through their timely redistribution at all stages of the research-to-production cycle, the duration of which, as a result, is reduced by a factor of two or more.

The experience of the all-union scientific-production association "Soyuzgazavtomatika" is now finding still wider application within its economic sector, not only for hastening the process of introducing individual forms of new technology, but also for solving large scientific-technical problems arising in individual industrial complexes. In the latter instance, the creation of a complex creative team is a conceptually new organizational form. For example, in fulfilling work on the complex automation of one of the largest gas fields in the Ukraine, Krestishchenskoye, a team was created in which there were highly qualified specialists from the Khar'kov gas industry administration, the all-union production association "Ukrgazprom," the all-union scientific production association "Soyuzgazavtomatika," the project institute "Yuzhniigiprogaz," "SPKBPromavtomatika," and others. A new form of organization of the work of specialists of two ministries (the USSR Ministry of the Gas Industry and the USSR Ministry of Instrument Making, Automation Equipment, and Control Systems) permitted the accomplishment in 1979 of complicated organizational and scientific-technical tasks relating to hastening automation and remote-control of plants for the complex preparation of gas on the basis of new instruments and automated systems and the reconstruction of local automated systems and technological control systems.

The organizational methods are the same as those under the scientific-production association. After investigation of the general status of automation, the team outlines the necessary amounts of SRED work, the manufacture of a designated complex of technological resources, and the amounts of work and time allotments for adjustment and maintenance work. At meetings held no less than twice a quarter, with participation by all representatives, work progress is analyzed in detail and corrections are made in plans and work schedules for introduction into production.

It is worth special attention that the use of complex creative teams permits compressed-time introduction of new forms of technology and technological processes which are new in principle within an economic sector and the application of which basically changes traditional engineering and technology. The result is not only the reduction in time for the solution of a scientific-technical problem but also a significant increase in the effectiveness of production, improvement in the quality of products and an increase in reliability of equipment.

The experiences of other economic sectors in shortening the time required for introduction of new technology also may be of interest. Thus, in the Minsk Electrical Equipment Plant imeni B. I. Kozlov, with continuous planning for the introduction of scientific developments, their realization was hastened by a factor of 1.5 and the economic effect was raised by a factor of almost 2. The scientific-production association "Tulachermet" needed less than four years for the creation of the world's largest ferrovanadium plant, from semi-industrial trials up to the assimilation of the designed capacity for the complex. The manufacture of horizontal machines for casting steel and intermediate construction of experimental industrial plants took two years. A plant for dispersion of liquid metal, as a result of careful experimental development and shortening the intermediate stages, was designed, manufactured, and put into action within eight months, that is, a shorter time by a factor of 4 than the average for the country.

A reduction in time required for the introduction of innovations in associations and at enterprises has been provided by various management measures, among which are the following:

creation of scientific-production complexes within associations that have, as a rule, a well-developed experimental base;

organization of creative groups ("brigades") both from within the association and from among economic sectors including designers and technologists as representatives of the producing factory and representatives of the requestor.

the development of a complex system for quality control of products on the basis, as a rule, of standardization and unification of new designs and technological processes. Such systems, essentially, represent long-term programs for the development of production for concrete types of products; and

the introduction of automated systems of production management and the creation of standards to regulate the basic management functions of subordinate units.

These management measures are, in our opinion, the basic organizational methods for shortening SRED time and for increasing the economic effect from introducing new engineering models. An especially effective form of management is the organization of complex creative teams, which permits the realization of the program-goal method in solving scientific-technical problems and the institution of continuous, uninterrupted planning of the process of creating and introducing new technology and significantly raising the effectiveness of production through hastened assimilation of conceptually new, long-range scientific developments which largely determine the progress of an economic sector.

An important task -- to assure close interrelationship between the results of scientific research and capital investment -- must be accomplished by project organizations. At present, this interrelationship is very weak. Project and exploratory organizations gravitate toward capital construction, whereas NII's and KB's gravitate toward basic production. It is obvious that the necessity has arrived for an all-out treatment of the problem of the investment process as a single process for turning scientific-technical achievements, through capital investments, into production funds and also improve the management both of science and of capital construction. It is important to provide a certain synchronization of the development of these spheres of activity, creating conditions for the rapid realization of technical innovations in the broadening of socialist reproduction.

The problem of close interrelation between scientific-technical programs and capital construction is especially severe. Insofar as such programs planned for accomplishment under the 9th Five-Year Plan, the demand for capital investment made up about 0.4 percent of their total volume and, in many instances, time failures in equipping a plant for the development of new engineering and technology are caused not by difficulties in alloting the resources but by lack of coordination between plans for capital construction and plans for scientific-technical progress.

The number of units which have to be put into operation to correspond to scientific-technical programs has grown in 1979 and 1980 by a factor of almost two over 1978. The list of units subject to action in these programs was reported earlier by the USSR State Committee for Science and Technology to ministries and agencies to be included in their plans for construction and provision of necessary resources. However, the supplies, equipment and financial resources are not always allotted in full or in time. Because of this, the fabrication of experimental models of new engineering and technology and their assimilation are lagging.

There must also be optimization of the relationship between the volume of uncompleted scientific-technical developments and the production possibilities for their assimilation and introduction. In this connection, the introduction of some of the plan indicators for NII's, KB's, and industrial enterprises, in correspondence with the 12 June 1979 decree of the CPSU Central Committee and the USSR Council of Ministers, has great significance.

A large role is played by the organization of accounting for development that has been completed but not introduced into production. Up to the present time, such accounting has been lacking among the economic sectors; developments completed by NII's and KB's have been paid out of Unified Funds, but often they have not been used in production for a long time. As a result, many of them have become obsolescent and expenditures have become worthless; however, because of this, given developments have not been listed anywhere and responsibility has not been borne for them either by a ministry or a production association. That is why it seems advisable to reflect finished developments in the accounting of a ministry so that, having such information at its disposal, it can plan the further development of the economic sector.

These, in our opinion, are some of the ways to improve the management of scientific research developments and to shorten the time required for introducing new technology.

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NOVOSIBIRSK OBKOM SUPPORTS SIBERIAN AS BRANCH'S R&D COORDINATION EFFORTS

Moscow IZVESTIYA in Russian 17 Sep 80 p 2

[Article by Ye. Shemyakin, deputy chairman of the Siberian Department of the USSR Academy of Sciences and a corresponding member of the USSR Academy of Sciences, and M. Glazyrin, candidate of economic sciences, Novosibirsk: "A Bridge to Practice: From Science to Production"]

[Text] The pace of scientific-technical progress today depends on how dependable the bridge is between science and production. Academy science is called upon in these times not only to accomplish the study of great fundamental problems at a high theoretical level, but also to give the results of research a speedy appearance in the economy. Production, in its turn, must be prepared in every way for operational use of scientific developments on a wide front. However, the realization of such a relationship between science and production meets many difficulties in practice. That is why the Siberian experience in accomplishing this task takes on special interest.

In a decree of the CPSU Central Committee on the activities of the Siberian Department of the USSR Academy of Sciences, it was noted that the achievements of Siberian scientists in the field of theoretical research and in the introduction of its results into the economy favorably influence the increase in productivity and the conditions of labor. The experience of cooperation between academy science and production also received a favorable evaluation from the Central Committee of the party.

A collective search helped the Siberian Department of the USSR Academy of Sciences to develop an effective approach to solving the problems of introducing new technology into production and to give reality to the technology-introduction chain, "science - new technology - production."

One of the most interesting links in the technology-introduction chain has been the complex of ministerial design bureaus and institutes with experimental plants -- the so-called "technology-introduction belt" around the Novosibirsk Akademgorodok that was organized through the initiative of the presidium of the Siberian Department of the USSR Academy of Sciences and the Novosibirsk obkom of the party. Today, many thousands of associates work here and among them are doctors of sciences and more than a hundred candidates of sciences. Academy institutes transfer their developments and their proposals for improving production to the scientific-research institutes and design bureaus of the "technology-introduction belt."

Broad scientific cooperation, the exchange of highly qualified personnel, the continuous flow to economic sectors of the results of research that can only be achieved by big science -- these are the sources of strength for the "technology-introduction belt," and these make it the connecting link between the USSR Academy of Sciences and production.

Real experience has confirmed that those organizations of ministries and agencies that have the closest and most creative cooperation with the Siberian Department of the USSR Academy of Sciences have achieved the most serious results. Thus, for example, the Siberian special design bureau of the scientific-production association "Soyuzgeofizika," on the basis of utilizing the achievements of the institutes of geology and geophysics, automation, and electric metrology of the Siberian Department of the USSR Academy of Sciences and of the Siberian Scientific-Research Institute of Geology, Geophysics, and Mineral Raw Raw Materials of the USSR Ministry of Geology, have firmly occupied advanced frontiers in the development of its newest geophysical apparatus. The apparatus created by this collective has significantly broadened the possibilities for regional seismic exploration. These possibilities today are finding practical use in many production and scientific-research organizations of the country. The introduction of only one type of portable seismic remote-control station has permitted the achievement of an economic effect measured in many tens of millions of rubles.

As a result of joint work by the Institute of Thermophysics of the Siberian Department of the USSR Academy of Sciences and the special design bureau "Energokhimmash" of the Ministry of the Petroleum Refining and Petrochemical Industry, a model for a new effective plasmatron was successfully created in a short time. The yearly economic effect of only one piece of technology developed here, plasma-chemistry-produced vinylchloride -- a semiprocessed product for the production of polymers -- is around 3 million rubles. In this design bureau also, large plasmatrons have been created for the production of light castings and an effective apparatus has been built for making nitrous oxides.

Ten years' experience shows that cooperation between academy science and "belt" organizations has reduced work time by half in the creation and introduction of new machines and progressive production processes and the expenditures related to them have been reduced to one-seventh to one-tenth of their previous level. The scale of utilization of innovations continues to grow.

Having summed up the undoubted successes of the design bureaus and institutes of the "technology introduction belt," it is necessary to note at the same time that they could have done much more during the last decade; there are a number of serious reasons for this. Some of the ministerial research institutes and design bureaus, such as "Energokhimmash," do not yet have the necessary production base for making advanced models and experimental products. And the corresponding ministries do not evince special persistence in speeding the construction of such a base or providing it with up-to-date equipment.

In spite of the main purposes for creating the "belt" -- the solution of large, long-range problems of the economy -- certain ministries and agencies strive to subordinate the subject matter and every-day work of the research institutes and design bureaus to insignificant, narrowly departmental tasks.

"Gidrotsvetmet" of the USSR Ministry of Nonferrous Metallurgy is pushing aside the subject matter of the institutes of the Siberian Department of the USSR Academy of Sciences. This ministerial organization was located near the Novosibirsk Scientific Center so that it could help cope with the bottlenecks in the production of nonferrous metals, first of all in Siberia. But the most important task still remains unaccomplished. "Gidrotsvetmet" is occupied with fulfilling crash orders from the economic sector.

The complex development of the "technology-introduction belt" must be aided by all of the ministries and agencies that have their own institutions at Akademgorodok. They must allot resources for the construction of living quarters and units for cultural purposes and the needs of everyday life, in support of the collectives of these institutions and for the harmonic development of the academic center as a whole.

For a number of years, the academy scientific center, with a growth of four thousand in the number of workers, has invested 28 million rubles in the development of the city economy. Ministerial scientific-research institutes and design bureaus in the period of most active development in connection with this same growth in the number of workers, invested only 7 million rubles in the construction of living quarters and cultural life. Hence the insufficiency of children's and many other cultural and community institutions.

The presidium of the Siberian Department of the USSR Academy of Sciences and the whole collective of the scientific center, with the aid and support of the Novosibirskaya Oblast committee of the CPSU and local party and soviet organizations, is taking energetic measures for the improvement of planning and cooperation on scientific-research projects in the "technology-introduction belt." For the solution of questions of cooperation between academy institutes and "belt" organizations, a scientific council of the presidium of the Siberian Department of the USSR Academy of Sciences and scientific-technical councils on subjects and trends have been created.

But for the "technology-introduction belt" to provide maximum output to the economy, much more has to be done. The "Sibir'" program, directed toward the development of the natural resources and toward the complex economic and social development of the region, should become a unified complex program for the development of fundamental and applied projects of the Siberian Department of the USSR Academy of Sciences. The last word on the subject was given at the All-Union Conference on the Development of the Production Forces of Siberia. Its recommendations must lie at the foundation for planning scientific developments and the introduction of their results into production.

For the fulfillment of the plans mentioned and for the accomplishment of tasks in the introduction of technology, it is necessary that ministerial scientific-research institutes and design bureaus be organic parts of a unified science and production complex being managed by the Siberian Department of the USSR Academy of Sciences. Their subject plans, even if only half of them, must simultaneously be plans for the introduction into economic sectors of results from academy institutes.

It is time to take a look at plans for joint use of production areas and equipment (some ministerial organizations of the "belt" have significantly more than do academy institutes). In its turn, the experimental base of academy institutes can better serve the tasks of ministerial scientific-research institutes and design bureaus. To provide for the development of continuous programs for solving inter-agency problems that are the most important for the development of the whole economy -- this, perhaps, is the chief task of such cooperation.

It is necessary to create a unified system for the construction of living quarters and community centers of the scientific center and the "belt." The solution of social and community problems of workers at scientific-research institutes and design bureaus who live at Akademgorodok cannot be put off.

Further arrangement of fruitful cooperation between academy science and the "technology-introduction belt," to a decisive degree, will depend on a state approach to the matter of scientific-research institutes and design bureaus within the ministries and agencies to which they belong, and on the correct understanding in these organizations of the prospects for the development of economic sectors on the basis of scientific-technical progress.

During a tour of Siberia and the Far East, Comrade L. I. Brezhnev, in talking with party and economic representatives of Novosibirskaya Oblast, often stressed the importance of the stated line of advance: "We must further work to bring about a state of affairs where the active role of scientists can aid in solving the problems of uniting science with practice and at the same time aid the growth of the country's productive forces."

The "technology-introduction belt" is not the only bridge that unites Siberian science with production. In such a very large scientific center as Novosibirsk are concentrated hundreds of industrial enterprises and, in Novosibirskaya Oblast, there is agricultural production involving many economic sectors. Novosibirsk is known also as a center for many tens of ministerial scientific-research institutes and design bureaus and project-design organizations, and 16 higher educational institutions operate here.

The creative cooperation of academy institutes with these collectives has called into being laboratories in academy institutes that are oriented toward needs of economic sectors and complex agreements between institutes of the scientific center with large factories, such as "Sibsel'mash" and the aviation plant imeni V. Chkalov. Institutes of the Siberian Department of the USSR Academy could not stand at the sidelines of such a very important task as the development of agriculture. Therefore, a program was developed and implemented for complex scientific aid to the Iskitimskiy Sovkhoz, the purpose of which is to bring into the region and into the economic sector, after trial, new proposals in the fields of grain farming, vegetable growing, and livestock breeding.

With all obviousness, the problem arises as to further deepening of integration here of scientific with industrial potential. The council for cooperation for scientific-technical progress of the Novosibirskaya Oblast party committee is directing all its efforts to solving this task. The council inspires scientists and producers to undertake creative cooperation, encourages the scientific-technical community to disseminate advanced experience, and helps to eliminate duplication in research and design developments. With the aid of the council, an analysis has been done of the scientific potential of the oblast, and regional programs have been developed for scientific-technical progress for the 11th Five-Year Plan. However, the large scale and the interagency character of such projects and the necessity for its regular coordination with consideration for changing status in whole sectors of the economy, carries this work beyond the boundaries of the competence of local bodies. Even for the Siberian Department of the USSR Academy of Sciences, which fulfills the role of a super-agency coordinator of scientific work, it is difficult for it to exert its influence on the whole diverse sphere of production.

In this work, the Siberian Department of the USSR Academy of Sciences is increasingly aware of assistance from the USSR State Committee for Science and Technology and the USSR State Planning Committee. In subsequent solutions of these problems, the Novosibirsk Scientific Center for fundamental research and its "technology-introduction belt" will respond to current tendencies toward the concentration of scientific-technical potential on basic trends in the productive forces of Siberia in the interests of the whole country. It is along these lines that preparations for the 26th CPSU Congress are progressing in the institutions of the Siberian Department of the USSR Academy of Sciences and the "technology-introduction belt," where Siberian experience in uniting big science with big industry and in agricultural development is being generalized.

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PLAN TO SPEED INTRODUCTION OF ADVANCED CASTING TECHNOLOGY

Minsk SOVETSKAYA BELORUSSIYA in Russian 11 Oct 80 p 2

[Article by Professor Ye. Bel'skiy, head of the Department of Materials and Foundry Production of the Belorussian Polytechnical Institute and doctor of engineering sciences, and D. Kukuy, head of the Scientific Research Division of Materials Sciences and the Technology of Foundry Production of the Belorussian Polytechnical Institute and candidate of technical sciences: "Specialized Production Needed: Science at Work"]

[Text] The casting industry continues its role as the leading supply base for machine building. The most important potential for increasing its effectiveness is tied to the introduction of new technological processes and materials that offer improvement in the quality and precision of castings, the reduction of labor input in their production, the increase in labor productivity, and the improvement of working conditions.

Present trends in the development of casting are concentration and specialization in the production that supplies modern technological and transportation equipment. However, the casting industry in the republic is characterized by dispersion among a large circle of factories, ministries, and agencies; manufacture of cast stocks occupies over 120 shops and sections at enterprises of various industrial sectors. In this connection, half of such shops are either distinguished by more than a modest level of production, are unprofitable, or are poorly equipped technically. In these shops, it is difficult to improve labor conditions, and the amount of waste is being reduced slowly. In them, it is extremely complicated and, at times, unprofitable to introduce developments in casting science -- advanced technology and equipment. The results are low quality castings and excessive allowances for mechanical treatment.

As a characteristic example of the slow introduction of progressive technological processes in casting shops of the republic, we can use the extremely effective technological processes for the manufacture of rods for hot and cold fittings. However, a consequence of this is that in small-capacity shops with small-series and individual production, the introduction of such highly productive processes is unprofitable and they do not find application. Many examples like this can be introduced.

What is the way out of this? It is represented in the creation of regional specialized central casting plants for producing castings of the widest variety. Similar plants have been called upon to become the supply base for the general machine-building enterprises of a given region. The idea of centralized casting must be realized more boldly in the plan for interagency cooperation. Created on the same footing, such specialized large enterprises could provide the most advanced technological processes, equipment, and materials. It is known that a similar type of factory is paying for itself in a short time. In this connection, the advantages are evident: economical use of energy and materials and other natural resources, to say nothing of the overall increase in labor productivity and the cultivation of production.

In the creation of such enterprises there is still another very important feature. They will become centers for the development and introduction of new scientific ideas. Scientific-research and experimental-industrial subunits fit into them well as organic elements.

Meanwhile, in the republic we do not have a single coordination center that could set a high level for materials and for technological cultivation in the casting industry or that could create a real store of ideas and at the same time influence the hastening of technical progress.

In this plan, it would be desirable to focus attention on some of the achievements of science by higher educational institutions, which have accumulated a large quantity of good ideas and completed laboratory research. However, inadequate practical study has led to limitations on their introduction into production by one obstacle or another.

As a characteristic example, we can introduce the experience of our departmental scientific-research section. It is engaged in research in the field of materials study for casting forms and casting tools (cutting, punching, and pressing).

In recent years in casting shops, a sharp deficiency has been felt in graphite fire-resistant coverings necessary for preserving the surface quality of cast components. For a number of factories, the department has studied, researched, and approved new nongraphite coverings based on the plentiful natural minerals schungite and pyrophillite. However, widespread introduction of them was possible only with a complex approach to the problem, that is, the organization of powdered filler production, centralized distribution of factories, development of technical specifications for the coverings, and so forth.

Analogous problems are arising also with easily worked liquid glass mixtures, which at present have been introduced only at a few factories, where improvement in the workability by a factor of 10 to 15 has been achieved.

With the aim of improving the technology for high-quality castings, the department has developed new structures for runner systems. In particular, it has proposed a whole range of sizes and types of special ceramic elements (filter meshes, universal filters for casting forms, and throttles of various sizes). They have been introduced at a number of factories in Belorussia and Lithuania with significant economic effect. But wide use of such systems is possible only under conditions of specialized casting production.

The shortage of high-quality quartz sand has become another problem; the demand for it has exceeded 20 million tons a year and continues to grow. Tests done by the department on sands from new Belorussian deposits and the regeneration of reclaimed casting materials can solve this problem. The introduction of these scientific developments promises not only a large economic effect but also will curtail the transport of sand by 40 to 60 percent.

An extremely long-range development is the technological process developed by the department for the utilization of coke granules, which are still practically never utilized. Industrial approval of this process (Minsk factories for heating equipment, automobiles, and automatic lines) has shown its high economic effectiveness.

Significant experience in scientific research and practical introduction of the results have been accumulated in the field of the materials science for technological metal-treatment fittings. Thus, research has shown that cast metal in many ways is more effective than forged metal under conditions of increased pressure and temperature. Along with large savings of highly alloyed steel, it appears to be possible -- and this is supported by tests at the Minsk Tractor Plant -- to increase the durability of punches by 50 to 80 percent. The manufacture of cast metal-cutting tools, including those made by electroslag casting, lowers the nonproductive loss of scarce metal in shavings by 30 to 40 percent. The testing of experimental batches of cast tools conducted under heavy conditions of machining stocks from fast-cutting steel, show that durability grows by a factor of two. Very long-range work is being done on the utilization in heat treatment of protective diffusion coating of equipment that has a high metal content and expensive technology.

However, the results of all this research are being introduced in a single factory or, in the best circumstances, at several factories. The diffusion of new technological methods and equipment is held back by the dispersion of casting production among many enterprises. But in small shops almost any innovation is of little effectiveness. The problem can only be solved by the creation of a regionally centralized factory. Only at such an enterprise can practically all of the results of successful research work be introduced.

Such a factory, besides its production tasks, is able to provide as an experimental-industrial base its own scientific subordinate unit -- a large interagency scientific research laboratory. The basic missions of such a laboratory should be the generalization of advanced experience in materials sciences related to casting, development of new materials and technological processes, their many-staged approval, and wide introduction of the results into production. In summary, as we see it, the greatest effect and output can be achieved by putting resources into science. In this connection, we must not forget the words of L. I. Brezhnev at the 25th CPSU Congress that "the practical introduction of new scientific ideas is, today, a no less important task than is their development."

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RSFSR DEPUTY MINISTER OF HIGHER AND SPECIALIZED TECHNICAL EDUCATION ON VUZ RESEARCH

Moscow SOVETSKAYA ROSSIYA in Russian 10 Oct 80 pp 1-2

[Interview with E. K. Kalinin, RSFSR deputy minister of higher and secondary specialized education, on planning and improving VUZ research and coordinating scientific activities of institutions of higher learning, by Ye. Syrtsov and V. Fedyakin: "Practice Provides the Estimate"; date and place not given]

> [Text] The scientific potential of the Russian Federation's higher school is truly unique. More than half the doctors and candidates of sciences who live in our republic and the large detachment of specialists in the most varied fields of knowledge are concentrated here. At their disposal are laboratories, equipment, libraries.... In order to utilize this force most efficiently, the cost-accounting scientific association of the RSFSR Minvuz [Ministry of Higher and Secondary Specialized Education] was created. Its task is to plan the research of higher educational institutions, increase its effectiveness, and coordinate the scientific activity of higher educational institutions.
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> What has the new association already achieved? What tasks has it posed for itself in the coming five-year plan? This is discussed by its general director, Deputy Minister of Higher and Secondary Secondary Specialized Education of the Republic E. K. Kalinin.

[Question] Last June, in presenting the newly-born scientific association in our newspaper, you mentioned impressive figures--the volume of research conducted by higher educational institutions, the number of authors' certificates, the number of developments introduced into the national economy, and so forth. But, as is known, the "unclaimed" scientific reserve of the higher school is still very significant....

[Answer] Yes, up to now the the science of higher educational institutions is like a powerful tractor which tows a small cart behind it. The period over which our association has been working--and it changed over to the new forms for planning and economic incentives only this year--of course is still too short to break the ways of minor, narrow-subject contracts between departments and laboratories and individual enterprises. Even now, almost 16,600 economic agreement subjects with an annual cost of only 30,000 rubles each have been put into operation in the system of Minvuz RSFSR. Each such work occupies an average of six specialists. About 9,000 are so-called state budget subjects--each for approximately 10,000 rubles per year. One or two people are working on them. I believe that comments here would be superfluous. But... a vicious circle is obtained. A developed research and test-design base is needed in order to cope with a more significant order, and in order to have it, it is necessary to conclude those contracts which will bring income and capital investments for the development of this base....

However, last year already the association achieved certain progress. For the first time the economic impact from the introduction of higher educational institution developments exceeded 1 billion rubles, and we provide a ruble of profit for a ruble of investments--however deceptive the "magic" of numbers, this tells us something. Using financial "levers" where possible, we strive to attract the largest possible number of VUZ's to extensive studies and to establish collaboration between them. Now 126 institutes are participating in 16 of the ministry's goal-oriented programs.

Goal-oriented programs permit the concentration of efforts of various educational and scientific institutions of the higher school on the solution of specific scientific and technical problems which require an integrated approach. Naturally, the necessity arises to finance such unusual scientific collectives in a centralized manner. (By the way, this also called into being the cost-accounting scientific association.) Now, the annual volume of goal-oriented programs is estimated at 90 million rubles. This is one fourth of the volume of all scientific research and test design work for the association as a whole.

Quite recently, the Board of the Minvuz RSFSR and the presidium of the USSR Academy of Sciences adopted the decision to initiate joint work on the program, "Automation of scientific studies and the training process." Twenty types of automated devices and systems for scientific studies have already been created in academic institutes and 40 in higher educational institutions. There was an abundance of "teaching automata" of every possible type at the last All-Union Exhibition of Scientific and Technical Creativity of the Youth. But the quality aspect of the matter causes concern: for the present, each one is working by itself and for itself and the dissipation of scientific forces and, as a consequence, the low level of automated teaching devices are inevitable.

The Kuybyshev Aviation Institute headed the goal-oriented program. It has the forces--its own OKB [bureau of experimental design] and test production. This is the first thing. Second is funds: the association gave 2 million rubles, 1.5 million by arrangement with the Academy of Sciences (as practice shows, it is simpler to solve financial problems when paired with such a "partner"). Third, the Volga people received the broadest rights: they can attract other higher educational institutions of the republic to collaborate on the basis of economic agreements. The purpose is to create computing and information complexes and the technical means for connecting the sensors of experimental units to computers to automate scientific research. This equipment, with the development of the appropriate softwear, will be used for active methods of instructing students. For example, in Novosibirsk University they will "conduct a dialogue" with the computer, solving and analyzing systems of differential equations, while in the Siberian Metallurgical Institute (city of Novokuznetsk) they are mastering the control of blast and open-hearth processes on special simulators.

[Question] Thus, goal-oriented programs are the most progressive form for organizing science in the higher educational institutions. However, as has already been stated, for the present they encompass only one fourth of all scientific research and experimental design work conducted in the higher educational institutions. What is hindering the active "sowing" of such a promising "field?"

[Answer] First of all, the difficulty of basic reorganization. It is not a matter of people.... It is more difficult to improve some economic mechanisms. Let us tell about a simple example. Minvuz RSFSR can assume the development of a program for reducing the employment of manual labor in the Russian Federation. It is an important and necessary matter. You understand it, I understand it, and they understand it in the republic's Gosplan. But, unfortunately, they do not have the funds for the centralized financing of large-scale interbranch programs of this type. The state plan does not yet contain the following column: "Science in the Higher Educational Institutions." There is "Education" which cannot support the present swift growth of higher educational institution research.

The higher school, as is known, is not simply qualified scientific personnel. It is important that they represent the most varied fields of knowledge. Furthermore, centers of higher educational institutions, in contrast with academy or branch centers, are more or less uniformly dispersed over the entire territory of the republic. Consequently, already in its nature the science of the higher school is capable of solving successfully the problems of an interbranch and regional nature. This is its strength, this is what the party and the government see as its task. But in order to master the republic's program potentials alone are not enough.... We hope that in the 11th Five-Year Plan the scientists of the higher educational institutions will not have to encounter the present difficulties in the state support of large-scale studies and developments having paramount importance.

[Question] El'vin Konstantinovich, in the "Temporary Statute" on the cost-accounting scientific association it is pointed out that it directs the scientific activity of all higher educational institutions which are subordinate to Minvuz RSFSR. However, up to now only 70 percent of them have received the right of membership in it. With what is this linked?

[Answer] All higher educational institutions which have joined the association have changed over to the new forms of planning and economic incentives. A certain experience and level of organization and development of the material and technical base for the studies are necessary for this. Qualified personnel are needed. Therefore, although membership in the cost-accounting association is also voluntary, we consider the candidacies thoroughly, as a rule selecting the biggest higher educational institutions with a large volume of scientific research. Other higher educational institutions also join them with time. In particular, this year the Moscow Technological and Leningrad Engineering and Economics Institutes were accepted. To enroll all higher educational institutions in the association at once would mean deranging the experiment, discrediting its idea.

[Question] To put it in greater detail, how does the status of the association's members differ from the status of the other higher educational institutions?

[Answer] To date, perhaps this is our main achievement: on 24 October 1979 the USSR State Committee on Labor and Social Questions and the Secretariat of the VTsSPS [All-Union Central Trade-Union Council] adopted the decision to introduce (for the present, as an experiment) the new system of economic incentive into the scientific research institutions and design, experimental-design, and design-technological organizations of higher educational institutions which are association members. Its essence is that now their funds for development and bonuses and the funds for social and cultural measures and housing construction depend directly on the result of the scientists' work. They are formed either from the additional profit of our ministry's enterprises (experimental and training-production shops, experimental plants, and so forth) or, if the development is being conducted on order of another department, from the funds transferred to them whose amount depends on the guaranteed economic impact from the introduction of the innovation.

Thus, broader possibilities appeared in the higher educational institution to pay bonuses to the best workers, for the construction of housing and installations for domestic services, kindergartens, sports structures, and rest bases, for the reconstruction of its scientific and production base, the acquisition of equipment, and so forth.

And up to 20 percent of the resources of the corresponding funds of the higher educational institutions go to centralized funds which permit financing the development of the inter-VUZ experimental-production base and serve as a unique "cashbox for mutual assistance" of the cost-accounting scientific association.

[Question] It appears that the best higher educational institutions received support while the fate of the "poor" ones was virtually unchanged. How will they fare?

[Answer] Here it is necessary to understand who to consider "poor." I do not argue that the recently created educational institutions have a weak material and technical base. The ministry is concerned about their development. But you see a different picture more often: the possibilities are present, but they are used one-sidedly and inefficiently.

In a number of higher educational institutions unique instruments and even computers stand idle while their neighbors--other higher educational institutions or departments--have a most urgent need for this equipment. The same can be said about the machine-tool inventory. Rectors and deans are trying to start up their own "natural business" no matter what happens. But what it is is no secret--most often it is a primitive, obsolete, lowly-productive technology.

It is necessary decisively to embark on the path of comprehensive collaboration--within the higher educational institution, between those of the city, and then of the region. It is namely this path which was followed in Tomsk, Leningrad, and Rostov-na-Don where attention was turned first of all to the reconstruction, specialization, and cooperation of the experimental and production base. And not only on an inter-VUZ, but also on an interdepartmental basis. It has been calculated that using this reserve alone, the volume of scientific research and experimental-design work in the higher school can be increased one and a half fold in the 11th Five-Year Plan in comparison with the present plan. This is a real challenge! Therefore, in 1981-1985 we are planning to create "inter-VUZ centers for the support of scientific research" also in Voronezh, Gor'kiy, Irkutsk, Kazan', Kalinin, Krasnoyarsk, Saratov, Sverdlovsk, and a number of other cities. The higher educational institutions must be bolder in establishing creative contacts with the USSR Academy of Sciences, branch institutes, and big enterprises and utilize their rich scientific and production capabilities. Our association always supports such initiatives.

[Question] The increasing volumes of scientific research, naturally, are requiring increased accounting on their effectiveness. Facts show that in some regions they lose sight of the national-economic benefits of the developments of higher educational institutions, in particular, of those which the students themselves are conducting. If, in the Volga region, there are 366 students per work recommended for introduction, in the Central Chernozem oblasts they are already 2,273.... Doesn't this indicate the extreme enthusiasm of the leaders of higher educational institutions for unique scientific orders to the detriment of the mass nature of the youth's scientific-technical creativity?

[Answer] Of course, this also happens--the ministry does not divest itself of responsibility for such facts. But there is another explanation for them: for the present, all is not well in general in the way we introduce developments. Some of them take two or three years each or even more to "go" from the higher educational institution to the enterprise. And in the overwhelming majority of cases, it is because of the absence of through planning in the "laboratory-design bureau-experimental production-practice" chain. Much, of course, depends on the activity of the cost-accounting scientific association, but the deciding word here should belong to the union and republic Gosplans, and the State Committee on Science and Technology.

One more difficulty is the disproportion which has formed between the volume of scientific research and experimental design work which has increased considerably in the last 15 years and the administrative-management personnel for science in the higher educational institutions which has remained constant. There are not enough "managers!" A typical detail: the wages of these personnel in Minvuz RSFSR do not exceed three percent of the wage fund of all those engaged in scientific research work. This is four to five times lower than in the system of the USSR Academy of Sciences or branch ministries. Hence, the "trouble" in the control, organization, and planning of scientific research work. On the one hand, this distracts the scientists and engineers who are forced to step forth in the role of planners and supply personnel to which they are unaccustomed, and on the other, it pushes some higher educational institutions toward the creation of a latent and ineffective control apparatus. It seems to me that the time has come to think seriously about strengthening the control staff for science in the higher educational institution. This would not only improve the interrelationships in the creative collectives, but would also raise all scientific activity of the higher educational institutions to a new stage.

Science is the "water of life" in the higher school. Only on the basis of intensive research can the teaching process be improved, the qualifications of the instructors be raised, and preparations for new specialities be begun in time. Each important scientist dreams of his own school and about the pupils, but a genuine pupil can appear only in the course of joint important and long-range scientific research work. In addition, this raises the discipline of the students and deepens their interest in study as well as in their chosen profession. The broad development of scientific studies in the higher educational institutions is a necessary help in the training of competent, creatively mature specialists.

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USSR STATE PRIZES FOR 1980

Moscow PRAVDA in Russian 7 Nov 80 pp 1, 3

[Decree of the CPSU Central Committee and the USSR Council of Ministers, attested to by Secretary L. Brezhnev of the CPSU Central Committee and Chairman N. Tikhonov of the USSR Council of Ministers: "On the Award of State Prizes of the USSR for 1980 in Fields of Science and Technology"]

[Text] The CPSU Central Committee and the USSR Council of Ministers, having examined the proposals of the Committee on Lenin and State Prizes of the USSR in the Fields of Science and Technology of the USSR Council of Ministers, decrees that the following State Prizes of the USSR for 1980 be conferred:

I. IN FIELDS OF SCIENCE

1. Vladislav Pavlovich BELYAYEV, candidate of technical sciences and head of a department; Vladimir Ivanovich BYLKIN and Aleksandr Stepanovich SKRIPNICHENKO, laboratory heads; Nikolay Vasil'yevich GREVTSEV, doctor of technical sciences and head of a section, and Anatoliy Nikolayevich YEVTYUNIN, chief engineer, associates of a scientific research institute; Georgiy Georgiyevich PETRASH, doctor of physical-mathematical sciences and sector chief at the Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences; Anatoliy Aleksandrovich ISAYEV, Mishik Ayrazatovich KAZARYAN, and Svetlana-Galina Vladimirovna MARKOVAYA, candidates of physical-mathematical sciences and junior scientific associates of the same institute; and Vladimir Anatol'yevich BURMAKIN -- for the development of physical principles and the creation of and research on metallic vapor impulse lasers and optical systems based on them with brilliance amplifiers.

2. Yevgeniy Aleksandrovich VINOGRADOV and Gennadiy Viktorovich KOZLOV, candidates of physical-mathematical sciences and senior scientific associates of the Physics Institute imeni P. N. Lebedev of the USSR Academy of Sciences; Aleksandr Mikhaylovich PROKHOROV, academician and laboratory chief, and Nataliya Aleksandrovna IRISOVAYA, candidate of physical-mathematical sciences and sector chief, associates of the same institute; Yevgeniy Mikhaylovich GERSHENZON, doctor of physical-mathematical sciences and head of a department of the Moscow State Pedagogical Institute imeni V. I. Lenin; Andrey Fedorovich KRUPNOV, doctor of physical-mathematical sciences and section chief, and Lev Isidorovich GERSHTEYN, chief engineer, associates of the Institute of Applied Physics of the USSR Academy of Sciences; Vyacheslav Vyacheslavovich MERIAKRI, doctor of physical-mathematical sciences and laboratory head, and Andrey Vladimirovich SOKOLOV, doctor of technical sciences and deputy director, associates

of the Institute of Radio Engineering and Electronics of the USSR Academy of Sciences; Mikhail Borisovich GOLANT, doctor of technical sciences and section chief, Aleksandr Andreyevich NEGIREV, candidate of technical sciences and sector head, and Viktor Sergeyevich SAVEL'YEV, candidate of technical sciences and senior scientific associate, workers at a scientific-research institute -- for the creation of submillimeter spectroscopy with backward wave tubes.

3. Nikita Nikolayevich MOISEYEV, corresponding member of the USSR Academy of Sciences and deputy director, Valentin Vital'yevich RUMYANTSEV, corresponding member of the USSR Academy of Sciences and laboratory head, and Aleksandr Aleksandrovich PETROV, doctor of physical-mathematical sciences and sector chief, associates of the Computer Center of the USSR Academy of Sciences; and Feliks Leonidovich CHERNOUS'KO, doctor of physical-mathematical sciences and section chief at the Institute of Problems of Mechanics of the USSR Academy of Sciences -- for the cycle of works, "The Dynamics of Bodies with Liquid-Filled Cavities," published between 1950 and 1975.

4. Sergey Georgiyevich GORSHKOV, fleet admiral of the Soviet Union, commander-in-chief of the USSR navy, and project leader; Vladimir Nikolayevich ALEKSEYEV, admiral and consultant to the Military Academy of the General Staff of the Armed Forces of the USSR imeni K. Ye. Voroshilov, Georgiy Petrovich GORSHKOV, doctor of geological and mineralogical sciences, Konstantin Alekseyevich SALISHCHEV, doctor of technical sciences and head of a department of Moscow State University imeni M. V. Lomonosov, Viktor Ivanovich FALEYEV, naval captain and the commander, Mikhail Petrovich SEREGIN, candidate of technical sciences, and Yelena Pavlovna CHECHULINAYA, senior editors, and Lidiya Sergeyevna LUKANOVAYA, editor, workers of the central cartographic shop of the USSR Navy; Aleksey Mikhaylovich MUROMTSEV, doctor of geographical sciences and head of a laboratory of the All-Union Scientific Research Institute of Marine Fishing and Oceanography; Andrey Sergeyevich MONIN, corresponding member of the USSR Academy of Sciences and director of the Institute of Oceanology imeni P. P. Shirshov of the USSR Academy of Sciences; Khoren Petrovich POGOSYAN, doctor of geographical sciences and consultant to the USSR Hydrometeorological Center; and Anatoliy Ivanovich RASSOKHO, admiral and chief of an administration of the USSR Ministry of Defense -- for the scientific work, "Atlas of the Oceans" (Volume 1 -- "The Pacific Ocean" and Volume 2 -- "The Atlantic and Indian Oceans," published in 1974 and 1977).

5. Merkuriy Sergeyevich GILYAROV, academician and head of a laboratory of the Institute of Evolutionary Morphology and the Ecology of Animals imeni A. N. Severtsov of the USSR Academy of Sciences, project leader; Dmitriy Aleksandrovich KRIVOLUTSKIY, doctor of biological sciences and senior scientific associate of the same institute; Nina Georgiyevna BREGETOVAYA, doctor of biological sciences and senior scientific associate of the Institute of Zoology of the USSR Academy of Sciences; Lidiya Georgiyevna SITNIKOVAYA, candidate of biological sciences and junior scientific associate of the same institute; Boris Aronovich VAYNSHTEYN, doctor of biological sciences and senior scientific associate of the Institute of the Biology of Inland Waters of the USSR Academy of Sciences; Issakhar Zel'manovich LIVSHITS, doctor of biological sciences and section chief at the State Nikitskiy Botanical Garden of the All-Union Academy of Agricultural Sciences; Yelena Sergeyevna SHALDYBINAYA, doctor of biological sciences and professor at Gor'kiy State Pedagogical Institute imeni M. Gor'kiy; Adelaida Dmitriyevna NIKITINAYA,

candidate of biological sciences and senior scientific associate at Moscow State University imeni M. V. Lomonosov; Yelizaveta Mikhaylovna BULANOVAYA, candidate of biological sciences and former senior scientific associate of the same university; Vsevolod Denisovich SEVAST'YANOV, candidate of biological sciences and department head at Odessa State University imeni I. I. Mechnikov; Galina Iosifovna SHCHERBAK, candidate of biological sciences and senior scientific associate of the Institute of Zoology of the Ukrainian Academy of Sciences; and Vsevolod Ivanovich VOLGIN, doctor of biological sciences -- for the monograph "The Detection of Ticks Living in the Soil," published in three volumes from 1975 to 1978.

6. Ivan Afanas'yevich SOKOLYANSKIY, candidate of pedagogical sciences, and Aleksandr Ivanovich MESHCHERYAKOV, doctor of psychological sciences -- for the cycle of works "The Theoretical Development and Practical Realization of a Psychological-Pedagogical System for Training and Educating Deaf-Mutes in the USSR," published from 1936 to 1974.

7. Vladimir Rodionovich VOLOBUYEV, corresponding member of the USSR Academy of Sciences and academician-secretary of the Azerbaijan Academy of Sciences, and Spartak Askerovich ALIYEV, corresponding member of the Azerbaijan Academy of Sciences and director of the Institute of Soil Sciences and Agrochemistry of the Azerbaijan Academy of Sciences -- for the cycle of works, "The Study of the Bases and Development of a New Trend in Science -- The Energetics of Soil Formation," published from 1973 to 1978.

8. Fedor Ivanovich KOMAROV, academician of the USSR Academy of Medical Sciences and department head at the First Moscow Medical Institute imeni I. M. Sechenov, and Nurmukhamed MUKHARLYAMOV, doctor of medical sciences and manager of a section at the All-Union Cardiological Scientific Center of the USSR Academy of Medical Sciences, project leaders; Vadim Vladimirovich MEN'SHIKOV, doctor of medical sciences and rector of the State Central Institute of Physical Culture; Ivan Ivanovich SIVKOV, doctor of medical sciences and department head, Vladimir Grigor'yevich KUKES, doctor of medical sciences and section chief, and Lyubova Il'inichna OL'BINSKAYA, doctor of medical sciences and senior scientific associate, workers at the First Moscow Medical Institute imeni I. M. Sechenov; Yuriy Nikitich BELENKOV and Yuriy Timofeyevich PUSHKAR', candidates of medical sciences and senior scientific associates of the All-Union Cardiological Scientific Center of the USSR Academy of Medical Sciences; Mirsaid Mirkhamidovich MIRRAKHIMOV, corresponding member of the USSR Academy of Medical Sciences and director of the Kirgiz Scientific Research Institute of Cardiology; and Lyubova Trofimovna MALAYA, academician of the USSR Academy of Medical Sciences and department head at the Khar'kov Medical Institute -- for the development and introduction into medical practice of modern methods of diagnosing the early stages of cardiac insufficiency, the mechanics of its development, prophylaxis, and treatment.

II. IN FIELDS OF TECHNOLOGY

1. Kurbanaliy Gulyamovich SADYKOV, candidate of technical sciences, director, and project leader, Viktor Stepanovich STARODUBTSEV, chief technologist, and Karamali MAMATKULOV, mechanical operator, workers of the Almalyk chemical plant; Vali Abduvakhidovich KHAMIDOV, former director of the same plant; Mikhail Vasil'yevich LYKOV, doctor of technical sciences and laboratory chief at the Scientific-Research Institute for Fertilizers and Insectofungicides imeni Professor Ya. V. Samoylov;

Sergey Konstantinovich VOSKRESENSKIY, candidate of technical sciences and former deputy director of the same institute; Yuriy Ivanovich KIPRIYANOV, deputy director of the All-Union Scientific-Research and Design Institute for the Chemical Machine-Building Industry; Aleksandr Aleksandrovich SUYETINOV, candidate of technical sciences and sector chief at the same institute; Georgiy Bronislavovich SADOVSKIY, project leader at the Sverdlovsk Affiliate of the State Union Institute for the Design of Basic Chemical Industry Plants; and Andrey Makarovich ALESHIN, deputy head of the All-Union Association of Basic Chemical Industry -- for the development, assimilation and industrial introduction of engineering and technology of processing low-grade phosphate ores from the Karatau Basin into highly concentrated fertilizers.

2. Petr Abramovich BRODSKIY, doctor of technical sciences and director of the Kalinin department of the All-Union Scientific-Research and Planning-Design Institute for Geophysical Research of Geological Test Holes; Real'd Viktorovich KITRANOV and Petr Nikolayevich KUPOVYKH, candidates of technical sciences, Vladimir Borisovich TAL'NOV, laboratory heads, Anatoliy Aleksandrovidh MOLCHANOV, doctor of technical sciences and director, Alekesy Illarionovich FIONOV, candidate of technical sciences and deputy director, associates of the same institute; Aleksandr Shmul'yevich KNISHMAN, chief geologist of the Nezhin expedition for geophysical research at test holes of the "Ukrgeofizrazvedka" trust; Ravis Lukmanovich SABIROV, deputy general director of the Ufa production association "Geofizpribor"; Salman Magomed ogli SULEYMANOV, chief geologist of the Yakkabagskiy geophysical expedition group of the association "Uzbekneftegazrazvedka"; and Mirat Ziatdinovich YUSUPOV, candidate of technical sciences and chief geologist, and Pavel Mikhaylovich KUDASHEV, chief of group, workers at the Leninogorsk geophysical cooperative office of the State Geophysical Trust "Tatneftegeofizika" -- for the development and introduction into the economy of highly effective and economical methods for testing oil and gas bearing strata and estimation of their hydrodynamic characteristics by means of geophysical instruments on a cable.

3. Isaak Kushelevich KIKOIN, academician and department head at the Institute of Atomic Energy imeni I. V. Kurchatov; Viktor Pavlovich KAPITONOV, candidate of technical sciences and senior scientific associate, and Leonid Ivanovich MATVEYEV, senior engineer, associates of the same institute; Timofey Vasil'yevich POPOV, chief designer, Yuriy Petrovidh ZAOZERSKIY, candidate of technical sciences and deputy chief designer, Anatoliy Yefimovich YERMISHIN, section chief, Al'bert Grigor'yevich SUKHOV and Vladimir Veniaminovich ZORIN, group chiefs, and Gennadiy Ivanovich VOLKOV, designer, associates of the design bureau for precision machine building; Sergey Georgiyevich PROKOF'YEV, director of a machine building plant; Evarist Ivanovich ORLOVSKIY, former head of a shop of the same plant; and Nikolay Markovich LYSTSOV, doctor of technical sciences -- for the creation, industrial assimilation, and introduction of a medical-biological laboratory ultracentrifuge.

4. Yevgeniy Artemovich BASHINDZHAGYAN, deputy minister of the automobile industry; Valentin Ivanovich ISAKOV, deputy general director of the Volga Automobile Plant imeni the 50th Anniversary of the USSR; Petr Makarovich KATSUR, candidate of economic sciences and director of economics and planning, Yuriy Georgiyevich KARNAUKHOV, deputy technical director, Yuriy Nikolayevich PEREVALOV, candidate of technical sciences, and Aleksandr Ivanovich SHENBERGER, heads of administrations, Aleksandr Vladimirovich KARABIN, shop head, Vyacheslav Mikhaylovich MATVEYEV, shop master, Alekeey Alekseyevich SINEL'NIKOV, metal craftsman, Ippolit Leonardovich

RYMKEVICH, party committee secretary, workers of the same plant; Aleksey Vasil'yevich NIKOLAYEV, director of the Dimitrovgrad automobile assembly plant; and Anatoliy Karpovich OSIPOV, deputy head of a section of the USSR State Committee for Labor and Social Problems -- for the creation and introduction of a complex system for organizing production, labor, management, and salaries at the Volga Automobile Plant imeni the 50th Anniversary of the USSR.

5. Yuriy Borisovich AVANESOV and Nikolay Ivanovich KRIVOGOV, candidates of technical sciences and senior scientific associates, Viktor Ignat'yevich BESSARABOV, candidate of agricultural sciences and laboratory chief, Gavriil Mikhaylovich BUZENKOV, academician of the All-Union Academy of Agricultural Sciences and director, and Aleksandr Aleksandrovich KEPCHANSKIY, deputy laboratory chief, associates of the All-Union Scientific-Research Institute of Mechanization of Agriculture; Aleksey Aleksandrovich POKUS, director, Aleksey Stepanovich KRAVCHENKO, candidate of technical sciences and chief designer at the special design bureau, Vadim Georgiyevich KUZ'MINOV, deputy chief of the special design bureau, Dmitriy Ignat'yevich KOZHUSHKO, group leader, and Ivan Ivanovich KURAMOV, chief of the bureau for root-harvesting machinery, workers at the Dnepropetrovsk Combine Factory imeni K. Ye. Voroshilov; and Nikolay Grigor'yevich PRUGLOV, field-team leader at the "Leninskiy Put'" experimental farm of the Kuban Scientific-Research Institute for Testing Tractors and Agricultural Machinery -- for the development and introduction into production of the highly productive machines RKS-6 and RKS-4 for harvesting sugar beets in the basic and irrigated zones of sugar-beet growing.

6. Gleb Samsonovich AKUROV, director of the Izhevsk heavy paper-making machinery factory; Yevgeniy Vasil'yevich GERLIVANOV, chief engineer, Meyer Meyerovich KOMAROV, chief of the central laboratory, Vladimir Mikhaylovich L'VOV, chief metallurgist, workers of the same factory; Nikolay Nikit'yevich ALEKSANDROV, doctor of technical sciences and section chief, Genrikh Sergeyevich MIRZOYAN, candidate of technical sciences and laboratory chief, and Ivan Romanovich KRANIN, candidate of technical sciences and deputy general director, workers of the scientific-production association for machine-building technology, "TSNIITmash"; Gennadiy Sergeyevich STRIZHOV, candidate of technical sciences and former deputy section chief of the same association; Nikolay Abramovich BUDAG'YANTS, director of the Lutugino metal roller factory; Vyacheslav Aleksandrovich CHICHAYEV, chief engineer of the All-Union Industrial Association for Pulp and Paper Machine Building; Avksentiy Ivanovich SHEVCHENKO, candidate of technical sciences and senior scientific associate at the Institute of Problems of Founding of the Ukrainian Academy of Sciences; and Nikolay Nikolayevich ZOREV, corresponding member of the USSR Academy of Sciences -- for the creation and wide industrial introduction of a complex of unique equipment and conceptually new technological processes for the production of single-layer and bimetallic hardware for crucial purposes.

7. Igor Leonidovich ANDREYEV, chief plant designer of the Leningrad Scientific-Research and Design Institute of Chemical Machine Building and project leader; Vladimir Matveyevich LUK'YANENKO, candidate of technical sciences and general director of the Sumi machine building production association imeni M. V. Frunze; Nikolay Illarionovich BANYA, team-leader for lathe operators of the same association; Vitaliy Andreyevich STEPANYUK, administration chief of the Ministry of the Gas Industry; Mikhail Dmitriyevich SOKOVIN, senior mechanical operator of the plant, and Khamit Nurmukhametovich YASAVEYEV, plant chief, workers of the Orenburg helium plant; Osip Aleksandrovich BEN'YAMINOVICH, candidate of technical sciences and

senior scientific associate of the All-Union Scientific-Research Institute of Natural Gases; Leonid Ivanovich LEPETYUKH, chief engineer for projects at the State Scientific-Research and Planning-Design Institute "YuzhNIIgiprogaz"; Gersh Feysakhovich TAMARIN, managing deputy of the trust for the erection of oxygen, cryogenic, hydrogen, and helium plants and factories "Soyuzkislorodmontazh"; and Petr Sergeyevich SUROV, former chief of the construction administration "Orenburg-energostroy" -- for the creation and introduction of plants for obtaining helium concentrate from poor helium-bearing gases, with productivity of 3 billion cubic meters a year, through gas processing.

8. Vladimir Aleksandrovich GALITSKIY, chief engineer, Yakov Nikolayevich GRIGOR'YEV and Yuriy Konstantinovich PODGAYSKIY, section chiefs, workers of the Leningrad Central Planning-Design Bureau; Vadim Antonovich DUKMASOV, bureau chief, and Nikolay Aleksandrovich KISELEV, team leader of ship-hull builders, workers at the Ship Repair Plant at Sovetskaya Gavan'; Afanasiy Andreyevich OKISHEV, chief designer of projects at the Far East Central Planning-Design Bureau; Aleksey Anatol'yevich OKOL'NICHNIKOV, section chief of the Ministry of the Maritime Fleet; Vladimir Anatol'yevich NEBOVSKIY, captain, Anatoliy Vasel'yevich PILIPENKO, chief engineer, Sergey Yefimovich RADCHENKO, boatswain, and Vitaliy Pavlovich UNZHIN, deputy section chief, workers of the Far East Ocean Steamship Line; and Nikolay Ivanovich KURTALEVICH, shipbuilding engineer -- for the development and introduction of new ocean coastal and transportation systems for freight and the technical means for solving social-economic problems in the development of the productive forces of the Far Eastern Basin.

9. Boris Nikolayevich SHAVYRIN, section chief and project leader, Oleg Afanas'yevich GORBENKO, candidate of technical sciences and senior scientific associate, Semen Semenovich SEMENOV, deputy chief engineer, Yevgeniy Leonidovich ANDREYEV, leading engineer, and Aleksandr Nikolayevich KLIMOV, bureau chief, associates of the Central Scientific-Research Institute of Scientific-Technical Information and Technical-Economic Research; Vasiliy Vasil'yevich ZARETSKIY, doctor of medical sciences and head of a department at the All-Union Scientific Research Institute of Clinical and Experimental Surgery; Valeriy Aleksandrovich SANDRIKOV, candidate of medical sciences and senior scientific associate of the same institute; Vladimir Mikhaylovich KHAYUTIN, doctor of medical sciences and laboratory manager at the Institute of General Pathology and Pathological Physiology of the USSR Academy of Medical Sciences; Anatoliy Mikhaylovich POYMANOV, candidate of technical sciences and general director of a scientific-production association; Vadim Aleksandrovich MIKHAYLOV, candidate of technical sciences and section chief at the All-Union Scientific-Research and Testing Institute of Medical Technology; and Boris Ivanovich LOBOV, laboratory chief at the K Affiliate of the All-Union Scientific-Research Institute of Physico-Technical and Radio Technical Measurements -- for the development of electromagnetic flowmeters for blood and the assimilation of their serial production and introduction into broad medical practice.

10. Ratmir Borisovich DOBROKHOTOV, section chief at the Scientific-Research and Planning-Design and Technological Institute of the production association "Uralelektrotyazhmash" imeni V. I. Lenin; Roman Nikolayevich YERSHOV, administrative deputy of the State Union Trust for Installation of Electrical Equipment at Electric Power Stations and Substations; Stanislav Ivanovich OSTAPENKO, chief

engineer of the Central Enterprise for Electrical Networks of the power production association "Donbassenergo"; Lev Leonidovich PETERSON, director of the All-Union State Design-Exploration and Scientific Research Institute for Power Systems and Electrical Networks; Yuriy Yakovlevich SEMENOV, chief engineer of the Main Administration for the Construction of High Voltage Electrical Networks and Substations of the Central and Southern Regions; Viktor Konstantinovich TARASOV, deputy general director of the Leningrad production association "Elektroapparat"; Nikolay Nikolayevich TIKHODEYEV, corresponding member of the USSR Academy of Sciences and laboratory chief at the Scientific-Research Institute of Direct Current; Vladilen Panteleymonovich FOTIN, doctor of technical sciences and director of the All-Union Institute of Electrical Engineering imeni V. I. Lenin; Noy Markovich CHERNYSHEV, candidate of technical sciences and section chief at the same institute; and Leonid Yefimovich SHTAN'KO, chief technologist for the production association "Zaporozhtransformator" imeni V. I. Lenin -- for the creation and introduction of electrical transmission of the ultrahigh voltage of 750 kilovolts, which provides connection to parallel operation with the Unified Electrical System of the USSR by associated power systems of CEMA member countries and the distribution of power from large atomic electrical stations.

11. El'mar Arnol'dovich AMAN, chief of the main production administration for power and electrification of the Estonian SSR; Kheyno Augustovich VASSIL, chief engineer of the same administration; Iosif Iosifovich GUGALINSKIY, team leader of a complex team, and Pavel Aleksandrovich LOGINOV, chief, workers of the construction administration of the Estonian GRES trust "Sevenergostroy"; Valentin Aleksandrovich KOZHEVNIKOV, former manager of the same trust; Mark Zakharovich GUDKIN, chief engineer, and Konstantin Ivanovich SENCHUGOV, director, workers of the Estonian GRES imeni the 50th Anniversary of the USSR; Vyacheslav Vladimirovich MITOR, doctor of technical sciences and deputy general director of the Scientific-Production Association for Research and Design of Power Equipment imeni I. I. Polzunov; Vladimir Aleksandrovich PRONIN, senior machinist of the Baltic GRES imeni Lenin Komsomol; Aleksandr Nikolayevich KHIMICH, chief project engineer of the Leningrad Division of the All-Union State Design Institute "Teploelektroproyekt"; and Il'mar Paulovich EPIK, academician of the Estonian Academy of Sciences and vice-president of the same academy -- for building and putting into operation in the Estonian SSR the first electrical power station in the world with a large capacity operating on local shale fuel.

12. Valentin Mikhaylovich ARSENT'YEV, Mikhail Borisovich ZAKSON, doctor of technical sciences, and Igor Mikhaylovich MOSHKUNOV, candidate of technical sciences, section chiefs, Yuriy Ivanovich DANILOV, doctor of technical sciences and deputy director, Yuriy Pavlovich KULESHOV, department head, and Vladimir Aleksandrovich KRASNOV, senior engineer, associates of a scientific-research institute; Vladimir Ivanovich BERZHATYY, Viktor Dmitriyevich BLAGOV, and Gennadiy Aleksandrovich DOLGOPOLOV, senior scientific associates, and Nikolay Semenovich KARDASHEV, corresponding member of the USSR Academy of Sciences and deputy director, associates of the Institute for Cosmic Research of the USSR Academy of Sciences; and Aleksey Sergeyevich GVAMICHAVA, candidate of technical sciences and senior scientific associate, and Aleksandr Georgiyevich SOKOLOV, doctor of technical sciences, section head, associates of the Central Scientific-Research and Design Institute of Metallic Structures for Construction -- for creating the first cosmic radiotelescope in the world, the KRT-10, and conducting experimental work with it aboard the long-duration orbital station "Salyut-6."

13. Arkadiy Alekseyevich AVER'YANOV, candidate of economics sciences and section chief, and Nikolay Maksimovich LEBEDEV, chief specialist, workers at the USSR State Planning Committee; Leonid Stepanovich CHECHEN, general director, and Nikolay Vasil'yevich PEKHTEREV, forge press operator, workers at the Kuybyshev motor construction production association imeni M. V. Frunze; Vladimir Borisovich SHNEPP, candidate of technical sciences and chief designer and administrative head of the special design bureau for compressor construction; Vladimir Pavlovich STUKALOV, designer at a design bureau for machine building; Boris L'vovich KUTARKIN, chief of the specialized administration "Orgenergogaz"; Lev Lazarevich POLIKOV, deputy chief engineer of the All-Union Scientific-Research and Planning-Design Institute for the Development of Equipment for the Gas Industry; and Vasiliy Aleksandrovich DINKOV, deputy minister of the gas industry -- for the creation of conceptually new modular-container gas-pumping assemblies with aircraft drive and their introduction into the USSR gas industry.

14. Sergey Pavlovich ANTONOV, doctor of technical sciences and section chief of the USSR State Committee for Science and Technology, project leader; Ivan Vasil'yevich FRANTSENYUK, candidate of technical sciences and director, Andrey Dmitriyevich BELYANSKIY and Zinoviy Petrovich KARETNYY, shop chiefs, workers at the Novolipetsk metallurgical plant; Viktor Ivanovich PONOMAREV, chief designer for metal-rolling equipment, and Anatoliy Grigor'yevich PANCHENKO, senior shop foreman, workers of the production association "Novokramatorsk Machine Building Plant"; Andrey Nikolayevich DRUZHININ, candidate of technical sciences and laboratory chief, and Boris Yefimovich ZHITOMIRSKIY, doctor of technical sciences and section chief, associates of the All-Union Scientific-Research and Planning-Design Institute of Metallurgical Machine Building; Boris Borisovich TIMOFEYEV, academician of the Ukrainian Academy of Sciences and director of the Kiev Institute of Automation imeni the 25th CPSU Congress; Yuriy Ivanovich FEDOROV, chief designer of the State Union Institute for the Design of Metallurgical Plants; Boris Ivanovich RESHMIN, candidate of technical sciences and sector chief at the All-Union Scientific-Research and Design Institute for Complex Electrification of Industrial Units imeni F. B. Yakubovskiy; and Sergey Leonidovich KOTSAR', candidate of technical sciences and docent at the Lipetsk Polytechnical Institute -- for the development of new processes and machines for the production of hot-rolled, high-quality steel, which has made possible the creation and assimilation, for the first time in world practice, of a wide-strip rolling mill with a productivity of more than 6 million tons of rolled sheets per year (NShS "2000") at the Novolipetsk Metallurgical Plant.

15. Igor Vladimirovich PROKOPOV, candidate of technical sciences and director of the Pavlodar aluminum plant imeni the 50th Anniversary of the USSR; Farid Abdul-Bakeyevich ALYKOV, chief engineer, and Aleksandr Ivanovich ISAYEV, deputy chief engineer, workers at the same plant; Yevgeniy Nikolayevich BESPALOV, director of the Nikolayevsk aluminum oxide plant; Yuriy Fedorovich UZKIKH, candidate of technical sciences, and Boris Il'ich LOPATIN, section chiefs at the same plant; Saparbek Sultanovich BERKETOV, candidate of technical sciences and factory director; Naum Solomonovich MAL'TS, candidate of technical sciences and laboratory chief, and Nikolay Stepanovich SHMORGUNENKO, candidate of technical sciences and chief engineer, associates of the All-Union Scientific-Research and Design Institute for the Aluminum, Magnesium, and Electrode Industry; Leonid Pavlovich NI, corresponding member of the Kazakh Academy of Sciences and laboratory head at the Institute of Metallurgy and Ore Dressing of the Kazakh Academy of Sciences; Anatoliy Konstantino-

vich STYAZHKIN, section chief of the All-Union Association for the Aluminum Industry, and Turar Baltabayevich TURSUNBEYEV, candidate of technical sciences and deputy chief of a section of the Kazakh State Planning Committee -- for the creation and industrial assimilation of a new means for processing low-grade bauxite, which has led to broadening the raw-material base for the aluminum industry.

16. Vladimir Vasil'yevich ALEKSEYEV, candidate of technical sciences and administrator of the bridge-building trust No. 5 of the Main Administration for Bridge Construction; Valeriy Nikolayevich BUGROV, deputy chief of administration for the All-Union Association for Special Projects "Gidrospetsstroy"; Dmitriy Vladimirovich YEREMEYEV, chief engineer of the administration of construction "Kuybyshevgidrostroy" of the Main Administration for Special Factory Construction; Pavel Kirillovich MOROZ, candidate of technical sciences and head of an administration of the USSR Ministry Power and Electrification; Nikolay Il'ich LITVIN, deputy minister of transport construction; Georgiy Petrovich SOLOV'YEV, candidate of technical sciences and head of an administration of the Ministry of Transport Construction; Mikhail Dmitriyevich TUL'CHINSKIY, section chief of the All-Union Design-Exploratory and Scientific-Research Institute "Gidroproyekt" imeni S. Ya. Zhuk; Anatoliy Viktorovich MOISEYEV, chief engineer of the bridge building trust No. 4 of the Main Administration for Bridge Construction; Onik Stepanovich MUTAF'YAN, chief engineer for projects of the State Design-Survey Institute for the Design and Survey for Large Bridges; and Filipp Mikhaylovich TER-MIKAELYAN, candidate of technical sciences and senior scientific associate of the All-Union Scientific-Research Institute for Transport Construction -- for the development and introduction of new design and technology for laying deep foundations for bridges and large industrial and power plants.

17. Aleksandr Sergeyevich SOKOLOV, former director of the Leningrad Porcelain Factory imeni M. V. Lomonosov and project leader; Zinaida Ignat'yevna METELITSA, director, Valintina Sergeyevna ALEKSEYEVAYA, senior engineer and technologiest, Larisa Petrovna VELIKOTNAYA, shop head, Nina Borisovna SHAL'NOVAYA, final inspector, and Terez Isaakovna TARASEVAYA, former laboratory chief, workers at the same factory -- for the creation and introduction of technology and the organization of the first industrial production in the USSR of bone china.

18. Vasiliy Ivanovich MELESHCHENKO, candidate of economic sciences and section chief of the Leningrad oblast committee of the CPSU; Kazimir Ignat'yevich LABETSKIY, chairman of the planning commission of the executive committee of the Leningrad city Council of People's Deputies; Vasiliy Ivanovich MASHOVETS, chairman of the planning commission of the executive committee of the Leningrad oblast Council of People's Deputies; Oleg Vasil'yevich FILATOV, general director of the Leningrad association for electronic instrument construction "Svetlana"; Nikolay I vanovich KOMENDANTOV, general director of the specialized production association (firm) "Detskosel'skoye"; Aleksey Stepanovich PASHKOV, doctor of juridical sciences and director of of the Scientific-Research Institute for Complex Social Research of Leningrad State University imeni A. A. Zhdanov; Vladimir Vladimirovich BITUNOV, candidate of economic sciences and chairman of the planning commission of the executive committee of the Moscow city Council of People's Deputies; Vasiliy Alekseyevich SHUL'GE, candidate of economic sciences and section chief of the same commission; Leonid Aleksandrovich BORISOV, secretary of the Moscow city committee of the CPSU; Ivan Aleksandrovich STROKOV, first secretary of the Kirov rayon committee of the CPSU of the city of Moscow; Vera Sergeyevna BYALKOVSKAYA, doctor

of economic sciences and director of the Institute of Economic Problems of the Complex Development of the Economy of the City of Moscow; and Igor Mikhaylovich ANTIPOV, subsection chief at the USSR State Planning Committee -- for the development and introduction of the geographical system of economic and social planning for the cities of Moscow and Leningrad and Leningradskaya Oblast.

III. FOR TEXTBOOKS

For Higher and Secondary Specialized Educational Institutions

1. Yakov Semenovich UMANSKIY, doctor of technical sciences and former professor at the Moscow Institute of Steel and Alloys, and Yuriy Aleksandrovich SKAKOV, doctor of technical sciences, department head of the same institute -- for the textbook "Physics of Metals: The Atomic Structure of Metals and Alloys," published in 1978.

2. Vladimir Aleksandrovich IL'IN, doctor of physical and mathematical sciences and department head at Moscow State University imeni M. V. Lomonosov, and Eduard Genrikhovich POSNYAK, doctor of physical and mathematical sciences and professor at the same university -- for the textbook cycle: "Analytical Geometry," published in 1971 (2d edition), "Linear Algebra," published in 1978 (2d edition), and "The Bases of Mathematical Analysis" in two parts, published in 1971 (3d edition) and 1973.

3. Georgiy Khosroyevich SHAKHNAZAROV, doctor of juridical sciences and deputy head of a section of the CPSU Central Committee, project leader; Aleksandr Dmitriyevich BOBORYKIN, corresponding member of the USSR Academy of Pedagogical Sciences and rector of the Leningrad State Pedagogical Institute imeni A. I. Gertsen; Yuriy Andreyevich KRASIN, doctor of philosophical sciences and prorector of the Academy of Social Sciences of the CPSU Central Committee; and Vladimir Vasil'yevich SUKHODEYEV, candidate of philosophical sciences and deputy chief editor of the journal PARTIYNAYA ZHIZN' -- for the textbook "Social Studies," published in 1978 (16th edition).

For Vocational-Technical Educational Institutions

4. Igor Samuilovich VYSHNEPOL'SKIY, teacher at the technical school No. 30, Moscow -- for the textbook "Technical Drawing (with Elements of Programmed Study," published in 1978 (2d edition).

For the Party Training System and Economic Education

5. Igor Dmitriyevich OSTOYA-OVSYAN (I. D. OVSYAN), doctor of historical sciences and section head, project leader; Yevgeniy Yul'yevich BOGUSH, candidate of historical sciences, Viktor Levonovich ISRAELYAN and Vladimir Petrovich NIKHAMIN, doctors of historical sciences and professors, Viktor Ivanovich POPOV, doctor of historical sciences, rector, German Leont'yevich ROZANOV, doctor of historical sciences and department head; Sergey Vladimirovich POKROVSKIY and Vladimir Feodos'yevich STRATANOVICH, candidates of historical sciences and docents, associates of the Diplomatic Academy of the USSR Ministry of Foreign Affairs; Andrey Ivanovich STEPANOV, candidate of historical sciences and former prorector of the same academy; Oleg Borisovich BORISOV, doctor of historical sciences; and Anatoliy Andreyevich GROMYKO (V. A. GRACHEV), doctor of historical sciences and director of the African Institute of the USSR Academy of Sciences -- for the textbook "The Foreign Policy of the Soviet Union," published in 1978 (2d edition).

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